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MINNESOTA

ANNUAL REPORTS

VOL. IV

Fourteenth Annual Report of the Forestry Commissioner of Minnesota for the year 1908. 6-45656

Fifteenth Annual Report of the Forestry Commissioner of Minnesota for the year 1909.

Sixteenth Annual Report of the Forestry Commissioner of Minnesota for the year 1910.

First Annual Report of State Forester 1911

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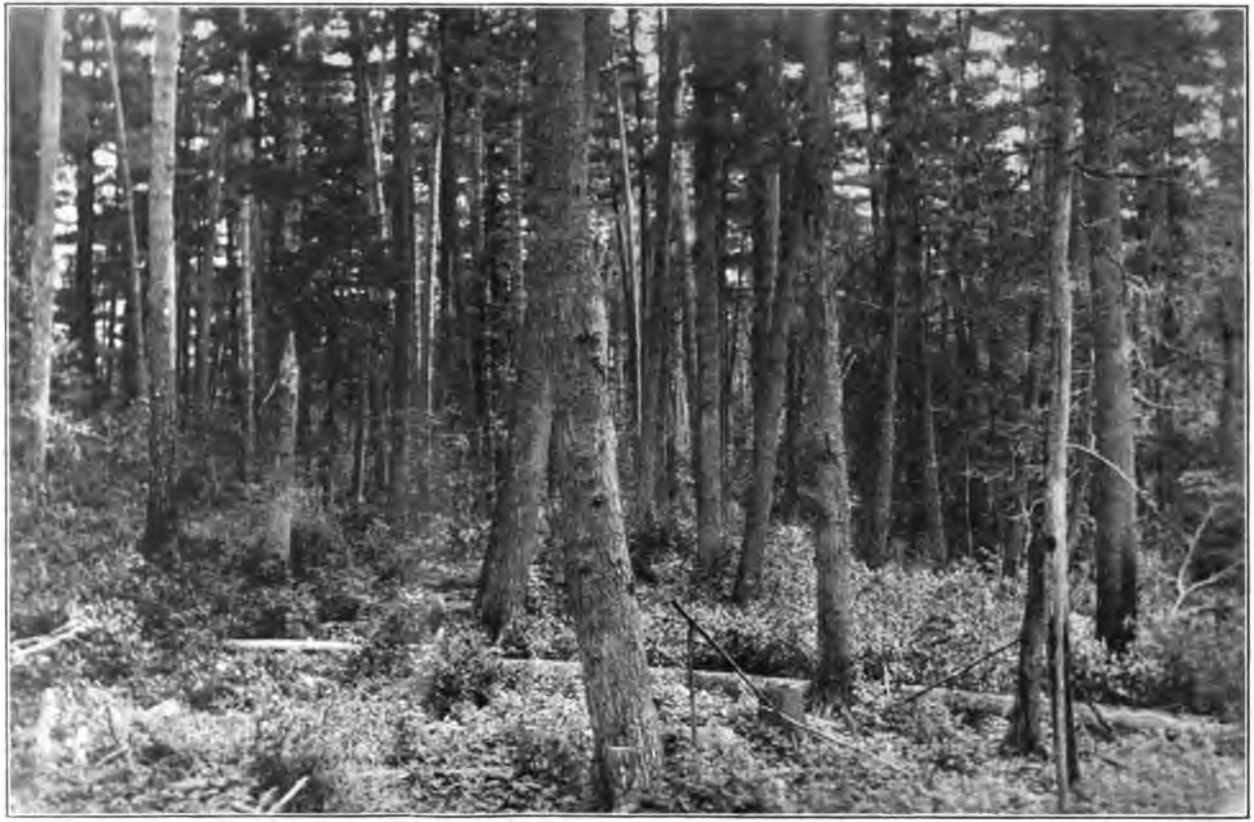


Exceptionally rich body of white pine forest in township 66, range 18. This tract was taken under the homestead law! Do not throw all the blame on the lumbermen. It is the people themselves, through their Congress, who are responsible for the lavish disposal of timber lands. The abuse, however, has been lessened in recent years by the wise policy of setting aside timber lands as national forests. Photographed for the Annual Report of the Forestry Commissioner of Minnesota.

FORESTRY

Walter Mulford

FOURTEENTH ANNUAL REPORT

OF THE

FORESTRY COMMISSIONER

(FORMERLY CHIEF FIRE WARDEN)

OF

MINNESOTA

AS REQUIRED BY CHAPTER 22 OF THE REVISED LAWS OF MINNESOTA, 1905.

FOR THE YEAR 1908

ST. PAUL, MINN.
PRINTED BY THE PIONEER COMPANY,
1909

STATE OF MINNESOTA
OFFICE OF FORESTRY COMMISSIONER,
ST. PAUL, JUNE 22, 1909.

Hon. S. G. Iverson, State Auditor:

SIR: As required by Section 3 of Chapter 22, Revised Laws of Minnesota, 1905, I have the honor to submit, herewith, my annual report for the year 1908.

Very respectfully,

C. C. ANDREWS,
Forestry Commissioner.

UNIV. OF
CALIFORNIA

FOURTEENTH ANNUAL REPORT
OF THE
FORESTRY COMMISSIONER
OF MINNESOTA.

My Special Report of the 28th of December last on the forest fires of 1908, is herewith repeated and occupies pages 3-20 of this report.

Since the Hinckley forest fire of 1894, in which 418 persons perished, there have been several very dry seasons in Minnesota, but none so dangerous as during 1908. April and May of this year were very dry in the northwestern part of the state, and many forest fires occurred in the counties of Cass, Crow Wing, Becker, Beltrami, Hubbard, Morison, Ottertail, Todd and Wadena. A more protracted period of dry and windy weather, however, prevailed during August and September in the extensive territory of about 6,000,000 acres, comprising the counties of Cook, Lake, St. Louis, Itasca, Carlton and Pine. Practically all of the inhabitants of the north shore of Lake Superior were occupied for weeks in fighting forest fires. Their situation was one of distress and terror.

DAMAGE BY FOREST FIRES, 1908.

From all reports received, the damage done by forest fires in Minnesota in 1908, exclusive of the destruction of the village of Chisholm, was $503,633. Including the loss at Chisholm, which according to popular rumor was $1,500,000, the total loss by forest fires was $2,003,633. The number of acres, mostly cut-over land, burned over or partly burned over, was 405,748.

The cause of many of the fires was as follows: Burning brush, 15; burning meadow, 9; campers, 11; clearing

301942

land, 47; fishermen and hunters, 16; from adjoining town, 17; railroad locomotives, 29; other causes, 6; unknown, 180.

The number of persons who fought fire was 5,277.

NORTH SHORE.

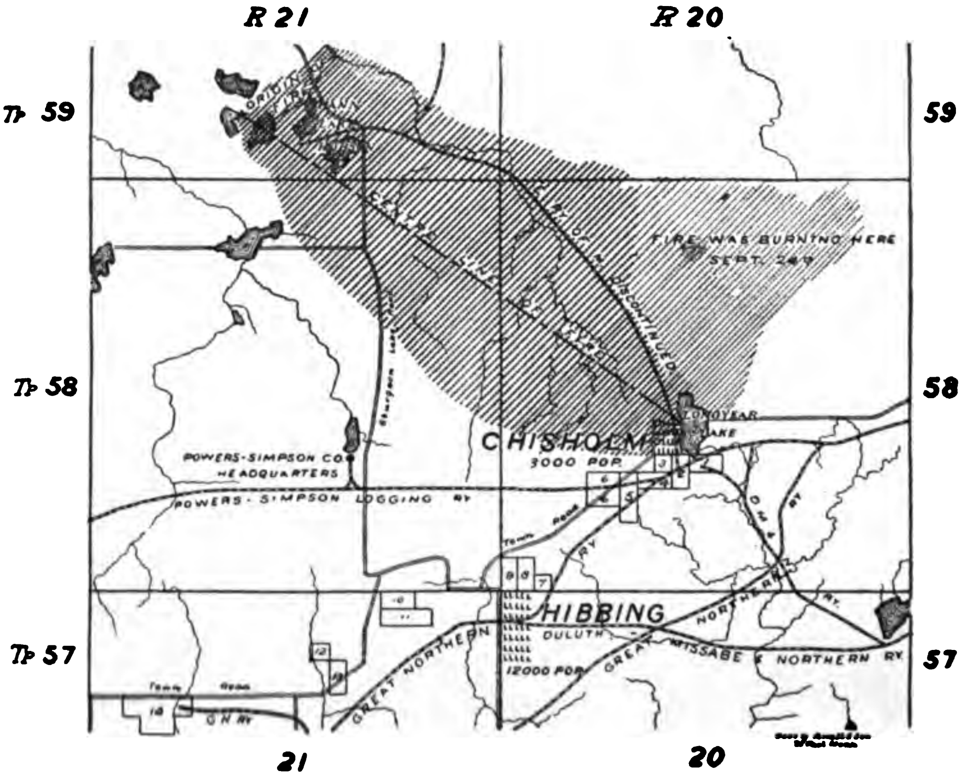
An urgent appeal for help in fighting fires having been received by me from the village of Hovland, about thirty miles east of Grand Marais, Cook county, at my request Mr. J. T. Black, chief engineer of the fire department of Duluth, promptly organized a crew of forty men, who, with proper supplies and under the charge of Captain C. W. Wilson, left Duluth on a steamboat September 13th and were gone a full week. Finding they were not needed at Hovland, they stopped at Lutsen, a point about twenty miles west of Grand Marais, where they rendered effective service day and night. At the same time Adjutant General Wood, on the U. S. Steamer Gopher, with a detachment of Minnesota naval militia, was doing everything possible for the relief of the settlers. Grand Marais was one of the places most afflicted.

The principal damage to standing timber by all the fires was on the Pigeon River Indian reservation, comprising the eastern portion of Cook county, and which is separated from Ontario by the Pigeon river. Mr. L. W. Ayer, of Belle Prairie, an experienced and reliable cruiser, who was employed by this office to visit the burned regions and investigate the origin of the fires and amount of damage done, reports that the total timber loss by fire on the north shore, including the Indian reservation, was $325,000.

Further west, hundreds of people were engaged successive days in fighting fire on the outskirts of Bovey, Nashwauk, Hibbing and Virginia, which places, on account of high wind, were considered in danger.

Iron Mines

1. Pillsbury.
2. Glen.
3. Clark.
4. Pearce.
5. Chisholm.
6. Laura.
7. Day.



Iron Mines

8. Bart.
9. Monroe.
10. Mahoning.
11. Hull Rush.
12. Latonia.
13. Cyprus.
14. Stevenson.

Map made for the Forestry Commissioner of Minnesota, showing the starting point and track of the forest fire which, on September 4, 1908, destroyed most of the village of Chisholm, St. Louis County, Minnesota. The fourteen iron mines indicated on the map by numbers were in operation at the time of the fire.

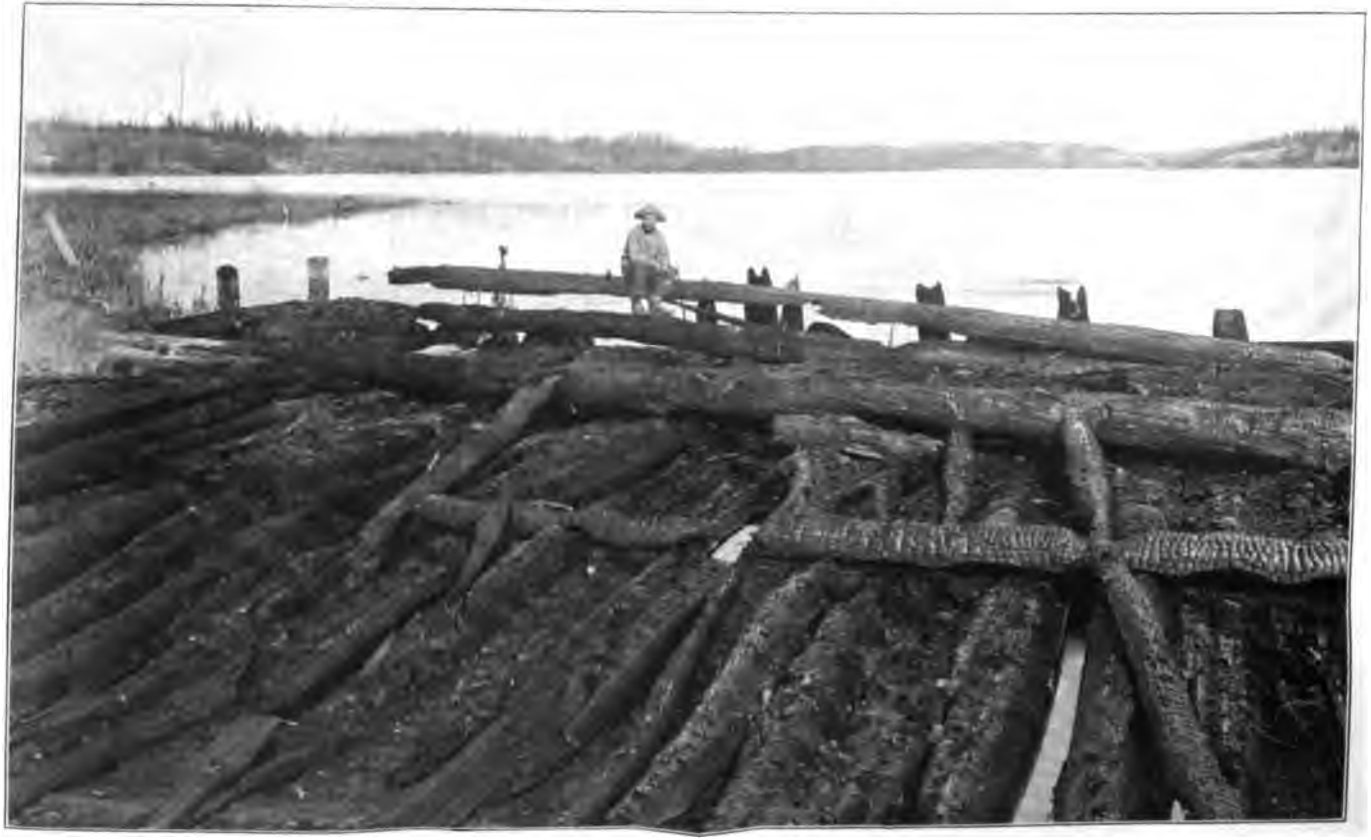
CHISHOLM FIRE.

The only actual catastrophe, however, occurred at Chisholm, late on the afternoon of Saturday, the 4th of September. The mining village of Chisholm (which is being rapidly rebuilt) was credited with a population of 3,000; but its area extended over a mile, and included on the east three mining plants with their own little villages, and which escaped injury by fire. Also the new Central schoolhouse and many other buildings were uninjured.

The Chisholm fire originated at a lake about ten miles northwest, in the unorganized township 59, range 21, containing only a dozen settlers, and had been set by fishermen from Chisholm who had frequented the locality Saturdays and Sundays several weeks previously. They had been driven out of two of their camping places by fire caused by their negligence. Their fire had been burning and smouldering for a week or more until the 4th of September, when a gale from the northwest drove the spreading flames directly towards Chisholm, over undulating country covered with slashings and scattering young growth, and which a few years previously was a heavy forest of pine and hardwood.

SLASHINGS CAUSED CHISHOLM'S DESTRUCTION.

I visited Chisholm October 1st and saw that an area of twenty or more acres in the village limits and close to buildings on its west side had, up to the time of the fire, been covered with slashings left from logging a few years ago. Had these slashings been previously burned, the fire would have stopped before reaching any building in the village. Had this office been notified by the local authorities of the existence of these slashings, they



Site of the camp of fishermen whose negligence with fire caused the destruction of the village of Chisholm, September 4, 1908. Photographed for the Forestry Commissioner of Minnesota, October 2, 1908.

would have been burned in calm weather at the State's expense, just as was done a few years ago at Blackduck, and this catastrophe, I feel satisfied, would not have occurred.

Mr. J. P. Neal, of Duluth, representing this office and writing from Hibbing under date of September 8th, says:

> "I went to Chisholm with Mayor Weirick, of Hibbing, this P. M., and we looked over the situation together. From many sources I learn that fires have been in progress back in the woods for at least six weeks. These were not looked after at all; the townspeople seem to have felt perfectly secure, because there were no woods near the town. Even at four o'clock on Saturday the Chisholm people considered that the town was not in danger and at that time, even, made no effort to check the fire. In an hour the town was doomed, fire leaping across acres of open clearing in clutch of the gale and set the wooden houses on fire. The waterworks plant was among the first buildings to be destroyed, leaving the people helpless. It seems to me that the neglect of the small forest fires was, to say the least, imprudent, but it is true that such fires are most difficult to quench entirely. They keep springing up after they are seemingly put out."

It was Mr. L. W. Ayer who ascertained the origin of the Chisholm fire. Writing to this office under date of Duluth, September 30th, he says:

> "I came into Duluth last evening from Chisholm and vicinity. Sent you a telegram this morning, 'Chisholm fire located,' etc. Thinking of it after sending, it occurred to me you might understand I had traced it to the *party* responsible therefor. This I did not accomplish. In fact, it is practically impossible to identify the guilty parties, but I have without question located the exact spot where the fire originated. Was caused by carelessness of fishing party from Chisholm. Referring to the map, you will find a chain of small lakes in the southwest corner of township 59, range 21. Fishing parties from Chisholm have been out to these lakes every Saturday and Sunday through the summer. Their principal rendezvous was on Hobson and Hahn lakes, as they were nearer

the road and thus more accessible. But at each of these places they burnt themselves out, and had to move to adjacent lakes to find camping ground. Their favorite camping place was on an island in Hahn lake. A week before the Chisholm fire started the island was burnt over. Then, the next, they went up to a small lake in secs. 32 and 33, township 59, range 21, and started the fire that destroyed Chisholm. This smouldered around the lake nearly a week, burning very slowly, as vegetation was comparatively green around the lake; but the high wind of the 4th and 5th, reaching a velocity of between 30 and 40 miles an hour, drove the flames straight for Chisholm. After crossing the Sturgeon Lake County road, it reached the doomed town, a distance of ten or eleven miles, in an hour and a half, and in less than an hour thereafter the village was in ashes."

Mr. Dillon Tierney, of Farmington, graduate of the forestry school, and who had rendered field service a year or more for the Cloquet Lumber Company, was employed by this office to go to International Falls via Bemidji and return through the Ash Lake country. He reported that the important pine forests there had not been injured by fire.

DEFICIENCY APPROPRIATION.

The standing appropriation of $5,000 a year provided by Section 1784, Revised Laws of Minnesota, 1905, to cover the expense of preventing and suppresing forest or prairie fires "in any season of unusual drought," was exhausted in October, and there are unpaid claims for fighting forest fires amounting to $12,500, due for the most part to poor people, who in many instances worked day and night and who deserve their pay at the earliest possible moment. These accounts are on file in my office and I respectfully recommend that a deficiency appropriation be made by the legislature for their payment at an early day.

DUTIES OF FIRE WARDENS.

The law making supervisors of towns, mayors of cities, and presidents of village councils, fire wardens, has been in operation fourteen years. Just as soon after the March elections as the address of these officers can be obtained, a printed copy of the law, with instructions, is each year sent them, and they know their duties. The law says: "They shall patrol their districts in dry seasons, and with the approval of the commissioner, *may employ patrols* to guard against carelessness in use of fire. It is true, a warden is paid only $2.00 a day for actual service, and for not more than fifteen days in a year, unless with the approval of the commissioner. But this would not prevent a vigilant warden, where the situation is dangerous, from going or sending out ten or twenty miles, if need be, to seasonably prevent or suppress fires.

How Our System Can Be Strengthened.

Although there have been several very dry and dangerous seasons during the thirteen years previous to this that our fire warden system has been in operation, yet the average damage from forest fires per year during this period has been only $30,000. The public takes little note of fires that are prevented or of property saved. The spring of 1900 was said by some people to have been as dry as the fall of 1894. June 22, 1900, the village of Moose Lake, Carlton county, was saved by the prompt suppression of a forest fire two and a half miles southwest of that place by the fire warden service. In April of the same year, the village of Cass Lake was saved from destruction by the fire warden service. The same can be said in respect to the villages of Blackduck and Tenstrike in May, 1904.

The majority of people are careful and law-abiding. But we must remember that the forest region of Minnesota is very extensive and contains the refuse of sixty years of logging. The activities of mining, logging, new settlements, new railroads, increase of population, and thousands of campers, tourists, hunters and prospectors, have increased the danger of fires since the present system went into effect. Fourteen years ago the country around Chisholm was a silent forest solitude. To-day, within a radius of ten miles of Chisholm, is an active population of 12,000.

In striving for improvement of our present system, PREVENTION is the thing to be mainly kept in view.

1. SLASHINGS. A law should be enacted requiring every one who cuts and fells timber or wood for commercial purposes to pile and burn the slashings—branches, tops and refuse—*at the time of cutting*. This is being done successfully by the United States forest service in the Minnesota national forest and with the cordial support of the lumbermen. Such a bill was agreed to by the forestry officials of Michigan, Wisconsin and Minnesota at a conference recently held at Madison, Wis. So far as I know, the Minnesota lumbermen will support such a measure. I endeavored to have such a bill enacted six years ago, and if it had passed, I feel sure the Chisholm calamity would not have occurred.

2. RANGERS. In dry and dangerous seasons there should be an energetic and reliable man to speedily visit localities where fires are liable to occur and inspect, assist or compel the activity of local wardens. Ontario has for many years employed rangers; and they are used successfully in the U. S. forest service and in the State of Washington. In a dry season forty or more rangers could be employed in Minnesota, and to secure the right kind of men their compensation for the comparatively short time they would be employed should be about $5.00 a day and their expenses.

3. SEVERER PENALTY. In the Game Warden Law the minimum penalty a justice of the peace can impose is $50.00, but there is no minimum penalty in the Fire Warden Law. In a dozen prosecutions under the Fire Warden Law the present year, the highest fine imposed was $50.00, but in some cases the fine was as low as $5.00 and $1.00. The law should be amended so that the minimum penalty shall be $50.00. A severer penalty than at present will arouse attention and make people more careful. A respectable citizen can be careless about fire, and it is very difficult to get a prosecution started against such men. Nevertheless, a rigorous enforcement of the law against forest fires is the truest kindness.

4. MORE PAY FOR LOCAL WARDENS AND HELPERS. At present the local warden is paid only $2.00 a day for time actually employed, and for only fifteen days in a year. Can we expect a busy farmer to take his team and drive off ten miles about a fire at that pay? I think it would stimulate his interest in his duties to pay him twenty-five cents an hour for actual service and his necessary expenses, and repeal the limitation of fifteen days. At present those who are pressed into the service to fight fire are paid only $1.50 per day. It was found necessary this year to pay $2.00 a day for such service. I recommend they be paid twenty cents an hour.

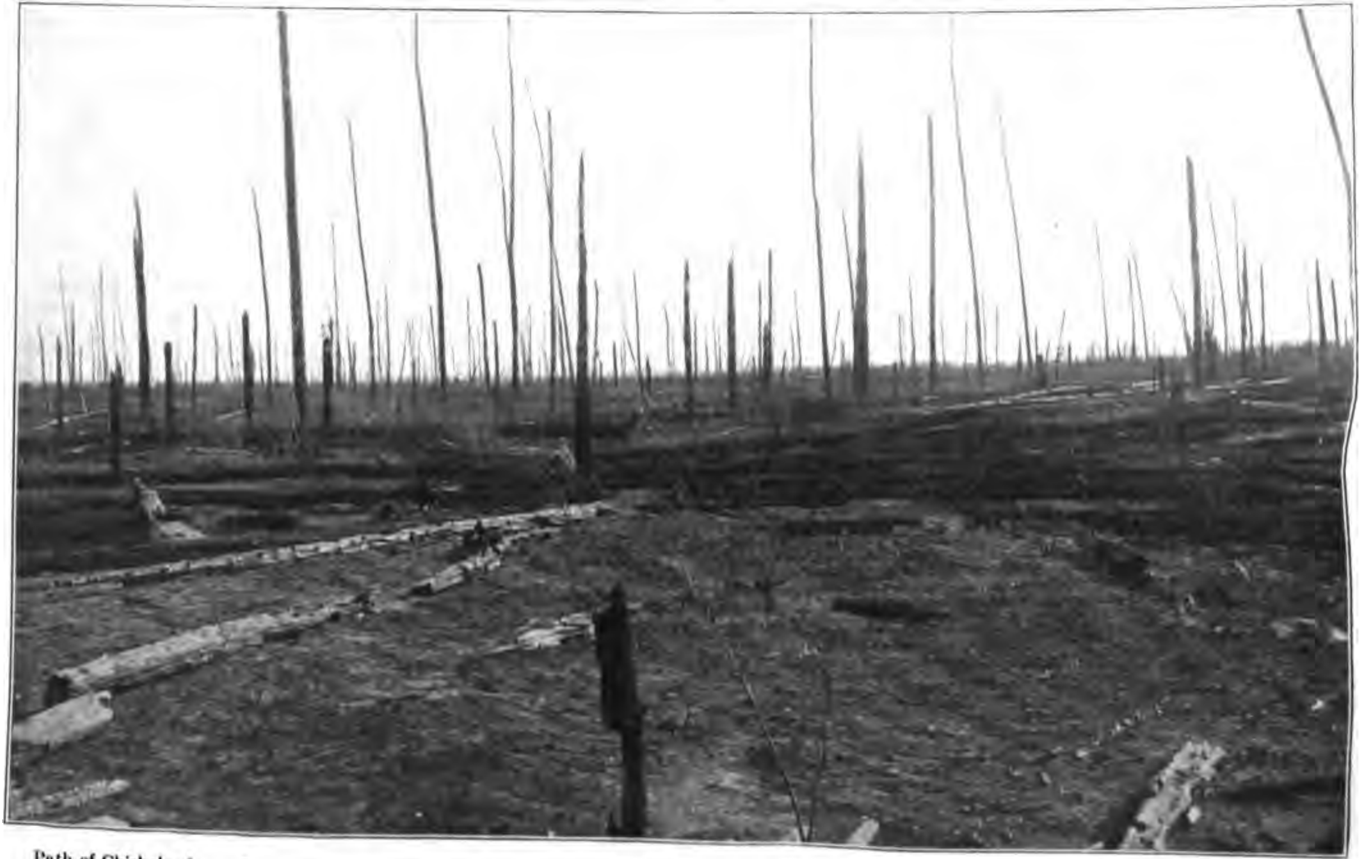
5. MORE MONEY. The standing annual appropriation now, as an emergency fund to be used by the forestry commissioner in preventing and suppressing forest and prairie fires in a region of about 30,000,000 acres, is only $5,000. The mere statement of this shows its absurdity. There is an additional $1,000 for prosecutions. Then the general appropriation bill passed each session carries $5,000 for each fiscal year for "Forest

Preservation" (erroneously headed in the last bill "Forestry Board"), out of which is paid the salary and office expenses of the forestry commissioner, the printing and free distribution of 4,000 copies of his annual report, and in *an ordinary year*, one-half of all the expense of local fire warden service—the counties in which such local service occurs paying the other half. This makes $11,000, and not a dollar more, that the State of Minnesota appropriates for Forest Preservation and its service of preventing and suppressing forest and prairie fires. In place of the standing annual appropriation of $6,000, I think $30,000 is as little as can safely be appropriated; and the item in the general appropriation bill for "Forest Preservation" should be increased to $10,000.

The State of Maine has a standing appropriation of $20,000 a year for the prevention and suppression of forest fires in *unorganized* townships. The organized townships take care of themselves. In 1904 the State of New York appropriated $93,000 for its share of the expense of fighting forest fires the spring of 1903. Ontario expends $100,000 annually and the lumbermen $60,000 in addition for preventing and suppressing forest fires.

The State of Minnesota itself owns 3,000,000 acres of school and swamp land, estimated to contain $15,000,000 worth of timber, which increases by growth at least 2 per cent, or $300,000 a year. Up to August 1st the State had received and turned into its permanent school fund $6,506,952 for timber cut on its own land. The appropriations I recommend are a very small amount for the State to pay for protecting its own timber from fire.

The standing timber in the northern forests in Minnesota to-day is worth $100,000,000. On an average $8,000,000 worth of this as it stands is being cut every year.



Path of Chisholm forest fire, at a locality six miles northwest of Chisholm, September 4, 1908. The valuable timber had been cut several years ago and the ground left covered with slashings. Photographed for the Forestry Commissioner of Minnesota, October 2, 1908.

SUMMARY OF FOREST FIRES, 1908,

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Aitkin County—					
Aitkin	April 20	200	$260	2	Unknown.
Balsam	April 18	300	50	None	Unknown.
Balsam	April 19	300	None	None	Unknown.
Beaver	Sept. 7	3	100	5	Unknown.
Clark	Oct. 13	80	None	3	Clearing land.
Idun	Oct. 16	100	150	33	R. R. locomotive.
McGregor	April 15	20	100	8	Clearing land.
McGregor	Oct. 13	130	210	11	R. R. locomotive.
Millward	Sept. 19	60	250	7	Unknown.
Township 44-22	Oct. 12	150	200	4	Burning brush.
Pliney	Sept. 19	200	50	25	Clearing land.
Wagner	April 18	400	500	6	Unknown.
Wagner	Sept. 25	130	600	22	Unknown.
Wagner	Oct. 15	1,200	4,000	71	Unknown.
Anoka County—					
Bethel	April 13	200	200	7	Unknown.
Bethel	April 16	200	150	7	Clearing land.
Becker County—					
Burlington	April 19	4,000	20,000	21	Unknown.
Green Valley	April 19	300	50	17	Unknown.
Height of Land	April 18	75	600	15	Unknown.
Holmesville	April 21	150	None	10	From town 139-40
Runeberg	April 18	1,400	1,800	40	Clearing land.
Runeberg	April 23	60	None	9	Unknown.
Toad Lake	April 19	20	10	4	From adj. town.
Two Inlets	April 21	1,200	700	35	From Indian res.
Two Inlets	April 24	640	....	13	From t'wn of Osage
Beltrami County—					
Buzzle	April 18	80	....	8	Burning brush.
Buzzle	April 23	200	25	10	Unknown.
Buzzle	May 5	2,000	200	20	Fishermen.
Buzzle	Sept. 21	2,500	1,500	16	Fm. Clearwater Co.
Corment	April 19	200	150	1	Unknown.
Corment	April 22	400	500	....	Unknown.
Corment	May 7	20	....	6	Camp fire.
Corment	May 10	600	1,000	11	Unknown.
Corment	Sept. 11	200	500	16	Unknown.
Durand	April 21	5	....	15	Clearing land.
Durand	April 21	40	500	5	Unknown.
Eckles	April 21	240	1,000	25	Clearing land.
Frohn	May 8	200	1,000	14	Unknown.
Grant Valley	May 8	120	200	31	R. R. locomotive.
Grant Valley	July 12	50	100	21	R. R. locomotive.
Jones	April 21	4,000	3,000	20	Campers.
Kelliher	May 15	80	500	1	Unknown.
Lammers	April 20	5,000	slight	30	Unknown.
Lammers	May 9	1,000	800	11	Unknown.
Langor	April 21	250	1,500	4	Clearing land.
Maple Ridge	July 8	80	None	14	Unknown.

SUMMARY OF FOREST FIRES, 1908—Continued.

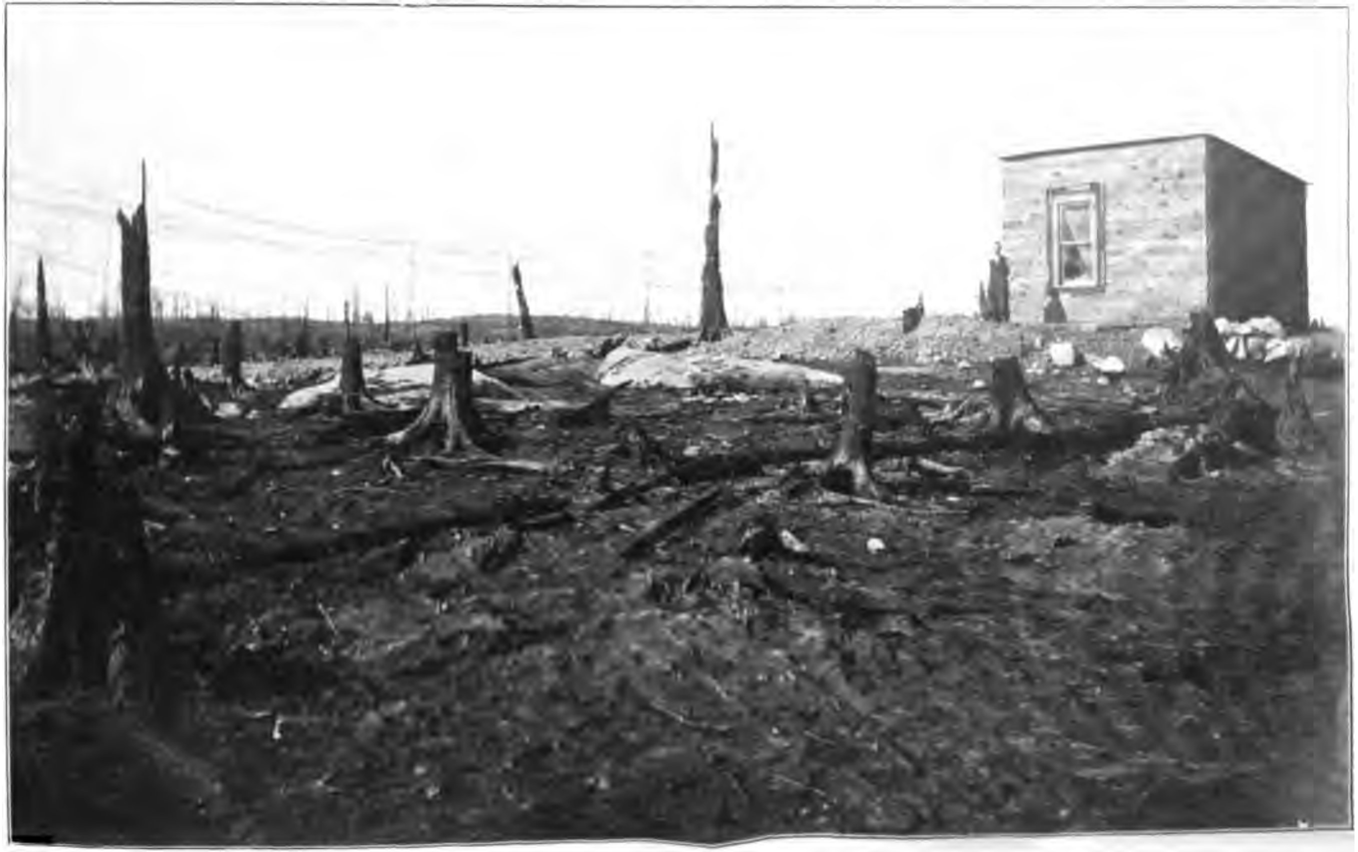
County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Beltrami Cou'ty–Cont.					
Nebish	April 20	3,160	6,000	18	Unknown.
Northern	April 22	400	2,000	17	Unknown.
Port Hope	May 7	700	2,500	21	Unknown.
Port Hope	Sept. 11	200	500	16	Unknown.
Port Hope	Sept. 21	500	1,000	14	Clearing land.
Summit	April 21	60	100	5	Camp fire.
Taylor	April 22	400	400	22	Unknown.
Turtle Lake	April 19	1,500	1,000	7	R. R. locomotive.
Turtle Lake	April 21	600	300	2	Unknown.
Turtle Lake	May 8	500	200	7	Clearing land.
Benton County—					
Gilmanton	April 19	240	75	....	Unknown.
Granite Ledge	April 12	100	75	4	Unknown.
Carlton County—					
Atkinson	Sept. 3	15	500	19	Unknown.
Atkinson	Sept. 5	40	50	7	Clearing land.
Atkinson	Sept. 3	60	250	9	Unknown.
Barnum	Sept. 8	1,000	200	25	R. R. locomotive.
Barnum	Sept. 15	300	slight	15	Clearing land.
Barnum	Sept. 16	500	200	40	Unknown.
Barnum	Oct. 14	600	120	8	Burning meadow.
Barnum	Oct. 15	300	20	4	Clearing land.
Blackhoof	Sept. 4	4,000	2,000	25	Unknown.
Eagle	April 20	40	75	2	Clearing land.
Eagle	May 10	120	300	4	Burning meadow.
Eagle	Sept. 8	160	800	1	R. R. locomotive.
Holyoke	April 18	500	100	......	Clearing land.
Holyoke	April 21	100	slight	3	Clearing land.
Holyoke	April 22	60	100	....	Clearing land.
Holyoke	Sept. 3	600	300	13	Camp fire.
Holyoke	Sept. 7	1,300	500	9	Unknown.
Holyoke	Oct. 15	2,000	600	22	From Pine county.
Knife Falls	Sept. 11	15	slight	65	Unknown.
Knife Falls	Sept. 11	30	150	100	Clearing land.
Lake View	May 9	700	300	16	Burning meadow.
Lake View	Oct. 14	30	600	3	R. R. locomotive.
Red Clover	Sept. 10	200	slight	4	Clearing land.
Skelton	Sept. 5	200	300	23	Unknown.
Skelton	Oct. 16	400	200	19	Clearing land.
Split Rock	Oct. 13	200	500	13	Unknown.
Twin Lakes	Sept. 20	20	100	7	Unknown.
Wrenshall	Sept. 1	6,000	9,000	150	Burning R. R. right of way.
Cass County—					
Ansel	April 12	1,000	75	10	Unknown.
Birch Lake	April 19	500	1,000	......	Unknown.
Deerfield	April 23	1,500	None	19	Unknown.
Hiram	April 19	2,000	500	11	Unknown.
May	April 11	500	200	1	Unknown.
May	Oct. 12	2	12	8	Traction engine.
May	Oct. 13	160	160	2	R. R. locomotive.

SUMMARY OF FOREST FIRES, 1908—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Cass County—Cont.					
Meadow Brook	April 10	3,000	1,000	20	Burning brush.
Meadow Brook	April 12	600	30	2	Unknown.
Meadow Brook	April 20	400	280	......	Unknown.
Moose Lake	April 20	4,000	400	20	Unknown.
Pillager	April 17	500	300	30	Unknown.
Pine River	April 18	160	slight	2	Unknown.
Pine River	April 19	900	1,000	14	Unknown.
Pine River	April 21	300	100	6	Unknown.
Pine River	April 21	2	80	25	Unknown.
Powers	April 19	800	200	8	Fishermen.
Township 143-26	April 12	500	200	......	Clearing land.
Township 134-30	April 14	4,000	500	10	Unknown.
Township 145-30	April 10	25	75	36	Burning brush.
Township 145-31	May 10	50	150	7	Unknown.
Township 145-31	Sept. 21	200	500	100	Unknown.
Walden	April 18	300	100	25	R. R. locomotive.
Chisago County—					
Branch	Oct. 18	5	None	......	Clearing land.
Clearwater County—					
Bear Creek	April 21	300	25	14	Unknown.
Bear Creek	May 9	640	100	8	Burning meadow.
Copley	April 23	6,000	600(?)	30	Unknown.
Copley	Sept. 18	80	100	5	Unknown.
Copley	Sept. 22	250	500	40	R. R. locomotive.
Copley	Oct. 10	160	125	7	R. R. locomotive.
Dudley	Sept. 22	400	200	3	Hunters.
Dudley	Sept. 23	1,500	500	14	Unknown.
Holst	April 22	600	150	12	Clearing land.
Itasca	April 21	500	800	20	Unknown.
Itasca	April 21	640	200(?)	13	From adj. town.
Itasca	May 10	200	100	11	Unknown.
Township 143-36	April 20	4,000	10,000(?)	14	Unknown.
Township 143-36	April 20	2,500	25,000(?)	19	Unknown.
Leon	May 10	500	150	10	Unknown.
Nora	Sept. 10	640	500	5	Burning meadow.
Shevlin	April 19	300	200	9	Unknown.
Shevlin	April 21	200	300	8	Unknown.
Shevlin	April 21	600	1,000	15	Unknown.
Shevlin	May 7	300	50	4	Unknown.
Shevlin	Sept. 10	120	500	7	Unknown.
Shevlin	Sept. 22	700	1,000	20	Fm. town of Copley
Shevlin	Sept. 22	500	1,000	8	Unknown.
Shevlin	Sept. 22	120	slight	20	R. R. locomotive.
Cook County—					
Colville	Sept. 2	5,000	10,000	22	Unknown.
Colville	Sept. 9	700	300	......	Unknown.
Grand Marais	Sept. 3	3	None	8	Clearing land.
Grand Marais	Sept. 9	30	None	1	Unknown.
Grand Marais vill'ge	Sept. 7	500	3,000	120	Unknown.

SUMMARY OF FOREST FIRES, 1908—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Cook County—Cont.					
Grand Marais	Sept. 6	1,600	2,000	12	Clearing land.
Hovland	Aug. 28	800	3,000	42	Clearing land.
Hovland	Sept. 4	6,000	25,000	27	Unknown.
Hovland	Sept. 4	4	100	19	Campers.
Hovland	Sept. 5	400	4,000	......	Clearing land.
Lutsen	Aug. 8	640	slight	......	Burning brush.
Lutsen	Aug. 10	30	60	.....	Unknown.
Lutsen	Sept. 12	2,000	10,000	30	Burning brush.
Maple Hill	Aug. 26	2	25	8	Unknown.
Maple Hill	Sept. 3	10	None	7	Camp fire.
Maple Hill	Sept. 7	8,000	3,000	70	Fm. t'n of Rosebush
Rosebush	Aug. 23	10,000	20,000	60	Unknown.
Tofte	July 13	15	150	24	Clearing land.
Tofte	Sept. 3	1,200	2,500	34	Unknown.
Crow Wing County—					
Allen	April 20	12,400	30,000	20	Hunters.
Baxter	April 12	1,200	1,000	2	Unknown.
Baxter	April 20	100	150	2	R. R. locomotive.
Baxter	May 9	1,000	750	6	Clearing land.
Deerwood	April 22	300	100	18	R. R. locomotive.
Ideal	April 19	320	320	8	Unknown.
Jenkins	April 12	500	840	......	Unknown.
Jenkins	April 18	600	200	15	Unknown.
Jenkins	April 19	3,000	200	25	Unknown.
Klondike	April 19	2,000	1,500	......	Campers.
Lake Edwards	April 20	800	600	21	Unknown.
Lake Edwards	April 24	500	100	6	Unknown.
Long Lake	April 12	2,000	200	(?)	Unknown.
Pelican	April 18	3,000	5,000	20	Clearing land.
Pelican	April 21	300	slight	12	Unknown.
Roosevelt	April 10	3,800	....	3	From adj. town.
Sibley	April 19	1,400	1,000	35	R. R. locomotive.
Hubbard County—					
Akeley	April 19	5,000	7,000	150	From adj. town.
Arago	April 14	200	10	None	Unknown.
Arago	April 21	160	500	......	Unknown.
Badoura	April 12	30	25	7	From adj. town.
Badoura	May 7	800	600	10	Clearing land.
Crow Wing	April 16	600	600	5	Unknown.
Crow Wing	April 18	60	None	8	Unknown.
Crow Wing	April 23	80	50	12	Unknown.
Crow Wing	May 10	300	200	17	Burning fire-break
Guthrie	April 20	6,000	5,000	20	Clearing land.
Helga	May 13	5	100	3	Unknown.
Helga	Sept. 10	500	600	15	Unknown.
Hendrickson	April 22	4,500	500	12	Unknown.
Hendrickson	Sept. 20	30	150	7	Threshing engine.
Henrietta	April 11	600	100	6	Unknown.
Henrietta	April 27	300	300	5	R. R. locomotive.
Lake George	April 17	25,000	1,200	15	Unknown.
Lake Hettie	April 21	1,000	300	9	Unknown.



Ground in village limits of Chisholm that was covered with slashings at the time of the fire, September 4, 1908. Photographed for the Forestry Commissioner of Minnesota, October 2, 1908

SUMMARY OF FOREST FIRES, 1908—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Hubbard Cou'ty—Cont.					
Laport............	April 21...	740	200	4	Unknown.
Laport............	April 18...	800	1,200	10	R. R. locomotive.
Nevis............	April 2....	600	1,000	13	Unknown.
Rockwood.........	April 19...	3,000	3,000	8	Unknown.
Schoolcraft.........	April 21...	4,500	5,000	21	Burning brush.
Straight River......	April 23...	700	700	40	R. R. locomotive.
Straight River......	May 9.....	600	600	8	Clearing R. R. right of way.
White Oak.........	April 19...	4,000	8,000	30	Unknown.
White Oak.........	April 22...	600	700	......	....
Isanti County—					
Dalbo.............	Oct. 12....	7	None	4	Unknown.
Itasca County—					
Balsam............	Sept. 9....	50	200	......	Unknown.
Balsam............	Sept. 23...	2,000	....	5	Unknown.
Township 57-26....	Sept. 23...	100	200	......	Tobacco pipe.
Town. 59-22 & 23..	Sept. 15...	2,000	400	6	Unknown.
Bearville..........	May 10....	40	50	4	Unknown.
Bearville..........	June 5.....	200	1,000	......	Unknown.
Bearville..........	Sept. 10...	2,000	1,400	6	Unknown.
Deer River.........	Sept. 9....	70	50	13	Unknown.
Deer River.........	Oct. 12....	80	100	4	Hunters.
Feeley.............	May 8.....	700	1,000	15	Unknown.
Grand Rapids......	April 12...	15	None	3	Clearing land.
Grand Rapids......	Sept. 11...	600	300	12	Unknown.
Grattan...........	July 8.....	60	250	2	Campers.
Iron Range........	Sept. 5....	1,600	1,000	200	R. R. locomotive.
Lake Jessie........	July 11....	1,000	2,000	16	Unknown.
Lake Jessie........	Sept. 12...	500	100	9	Unknown.
Marcell............	April 18...	700	4,000	30	Burning brush.
Marcell............	Oct. 11....	500	slight	......	Unknown.
Nashwauk.........	Sept. 8....	3,000	1,000	25	Unknown.
Third River........	May 9.....	200	200	4	Unknown.
Township 53-22....	April 19...	300	None	......	Unknown.
Township 53-22....	May 9.....	1	94	9	R. R. locomotive.
Township 54-26....	April 18...	2,000	2,500	6	Unknown.
Township 56-26....	April 14...	700	300	7	Unknown.
Kanabec County—					
Brunswick.........	April 18...	900	4,550	9	Clearing land.
Peace.............	May 10....	40	125	4	Campers.
Koochiching County—					
Evergreen.........	July 13....	20	75	2	Unknown.
Koochiching.......	Aug. 10....	60	300	20	Unknown.
Koochiching.......	Sept. 12...	300	200	10	Unknown.
Sault.............	July 10....	600	1,000	35	Clearing land.
Township 151-29...	Sept. 20...	5	50	4	Unknown.
Township 151-29...	Sept. 29...	2	100	12	Hunters.

SUMMARY OF FOREST FIRES, 1908—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Lake County—					
Beaver Bay	July 11	600	100	4	Unknown.
Beaver Bay	Sept. 3	1,800	....	......	R. R. locomotive.
Beaver Bay	Sept. 8	4,000	15,000	25	R. R. locomotive.
Crystal Bay	Sept. —	20	100	6	Unknown.
Silver Creek	Sept. 8	10,000	25,000	8	Unknown.
Silver Creek	Sept. 9	500	500	9	Unknown.
Silver Creek	Sept. 9	2,500	7,500	12	R. R. locomotive.
Two Harbors	Sept. 9	80	150	5	Unknown.
Two Harbors	Sept. 9	50	300	12	Clearing land.
Two Harbors	Sept. 17	250	2,000	4	Unknown.
Two Harbors	Sept. 13	20	150	9	Unknown.
Two Harbors	Sept. 23	80	300	7	R. R. locomotive.
Two Harbors	Sept. 20	120	slight	15	Unknown.
Two Harbors	Oct. 9	35	200	10	....
Two Harbors	Oct. 13	10	slight	5	Clearing land.
Mille Lacs County—					
Borgholm	Oct. 5	1	35	5	Hunters.
East Side	April 7	300	500	......	Campers.
East Side	Oct. 14	400	200	45	Clearing land.
Isle Harbor	Sept. 22	600	200	6	Unknown.
Kaitho	April 20	700	400	5	Indian campers.
Morrison County—					
Clough	April 11	500	200	......	Unknown.
Caldrum	Oct. 16	40	50	15	Clearing land.
Cushing	April 15	800	200	5	Unknown.
Cushing	April 18	300	150	25	R. R. locomotive.
Hellman	April 15	200	300	......	Unknown.
Parker	April 14	640	200	8	Clearing land.
Parker	April 18	5,000	1,000	25	From adj. town.
Parker	May 10	300	40	2	Unknown.
Parker	Sept. 20	15	60	7	Unknown.
Platte	April 13	2,000	1,200	6	Unknown.
Richardson	April 18	1,000	230	6	From adj. town.
Ripley	April 11	3,000	3,000	20	Unknown.
Ripley	Sept. 21	60	40	12	Unknown.
Rosing	April 19	4,480	1,295	10	Unknown.
Scandia Valley	April 18	5,000	1,000	20	Burning meadow.
Swan River	April 13	200	300	15	Hunter.
Swan River	April 18	100	250	10	Unknown.
Norman County—					
Fossum	May 8	30	20	9	Unknown.
Fossum	May 8	175	1,500	10	Unknown.
Ottertail County—					
Bluffton	April 13	100	50	4	Unknown.
Eastern	Sept. 21	1	3	7	Hunters.
Girard	April 18	240	50	30	Burning meadow.
Gorman	April 18	100	100	7	Unknown.
Maine	April 20	300	100	6	Burning brush.

SUMMARY OF FOREST FIRES, 1908—Continued.

County and Town	Date	Acres	Damage	No. Fire Fight-ers	Cause
Ottertail Cou'ty—Cont.					
Paddock...........	April 21...	1,600	65	21	Unknown.
Rush Lake.........	April 21...	500	300	11	Unknown.
Star Lake..........	April 18...	80	100	7	Burning brush.
Pine County—					
Birch Creek........	Oct. 15....	300	200	37	Unknown.
Bremen...........	April 20...	60	200	3	Unknown.
Bremen...........	Oct. 9.....	70	5	2	Unknown.
Bremen...........	Oct. 11....	560	700	36	Clearing land.
Bremen...........	Oct. 15....	9,000	1,500	66	From adj. town.
Bremen...........	Oct. 15....	40	None	4	Unknown.
Bruno.............	April 20...	3,000	500	3	Unknown.
Bruno.............	April 23...	500	200	4	Unknown.
Bruno.............	Oct. 15....	7,000	800	......	Unknown.
Bruno.............	Oct. 15....	1,000	slight	50	Unknown.
Clover.............	Oct. 17....	1,600	300	4	Hunters.
Danforth..........	Oct. 12....	3,000	3,300	70	From town. 41-18.
Dell Grove.........	May 8.....	40	100	3	Clearing land.
Fleming...........	Oct. 12....	6,400	200	12	Unknown.
Kettle River.......	Sept. 7....	25	51	5	Unknown.
Nickerson.........	May 9.....	4,000	300	35	R. R. locomotive.
Nickerson.........	Oct. 13....	500	200	28	Unknown.
Norman...........	May 20....	160	800	6	Unknown.
Partridge..........	Oct. 10....	600	200	20	R. R. locomotive.
Pine Lake.........	Sept. 21...	40	20	8	Burning brush.
Pine Lake.........	Oct. 9.....	160	None	16	Burning brush.
Pine Lake.........	Oct. 14....	320	150	30	Unknown.
Sandstone.........	Sept. 9....	400	100	14	Unknown.
Sandstone.........	Sept. 16...	30	6	8	Unknown.
Sandstone.........	Oct. 12....	4,000	80	70	Unknown.
Sturgeon Lake.....	May 9.....	65	300	6	R. R. locomotive.
Sturgeon Lake.....	Oct. 14....	800	200	37	Unknown.
Wagner...........	Sept. 23...	200	100	.....	Clearing land.
St. Louis County—					
Canosia...........	Sept. 6....	400	slight	12	Unknown.
Costine...........	Sept. 8....	300	....	30	Unknown.
Colton............	April 18...	60	125	3	Unknown.
Colton............	July 15....	2	15	4	Unknown.
Colton............	Oct. 13....	2	5	10	Burning brush.
Colton............	April 20...	160	15	18	Unknown.
Culver............	Oct. 21....	40	128	8	Unknown.
Duluth............	Sept. 5....	4,000	20,000	30	Clearing land.
Duluth............	Sept. 10...	500	500	......	Hunters.
Fern..............	Sept. 9....	200	....	......	Unknown.
French...........	April 20...	4,000	(?)	3	Unknown.
French...........	Sept. 1....	1,290	None	13	Hunters.
Grand Lake.......	May 11....	300	(?)	26	Fishermen.
Great Scott........	Sept. 4....	10,000	2,600	36	Unknown.
Great Scott (Virg'ia)	Sept. 9....	40	1,200	130	Unknown.
Meadowlands......	Sept. 11...	60	50	21	Hunters.
Nichols...........	Sept. 5....	3,000	600	100	Unknown.
Pike..............	May 24....	4	50	6	Clearing land.

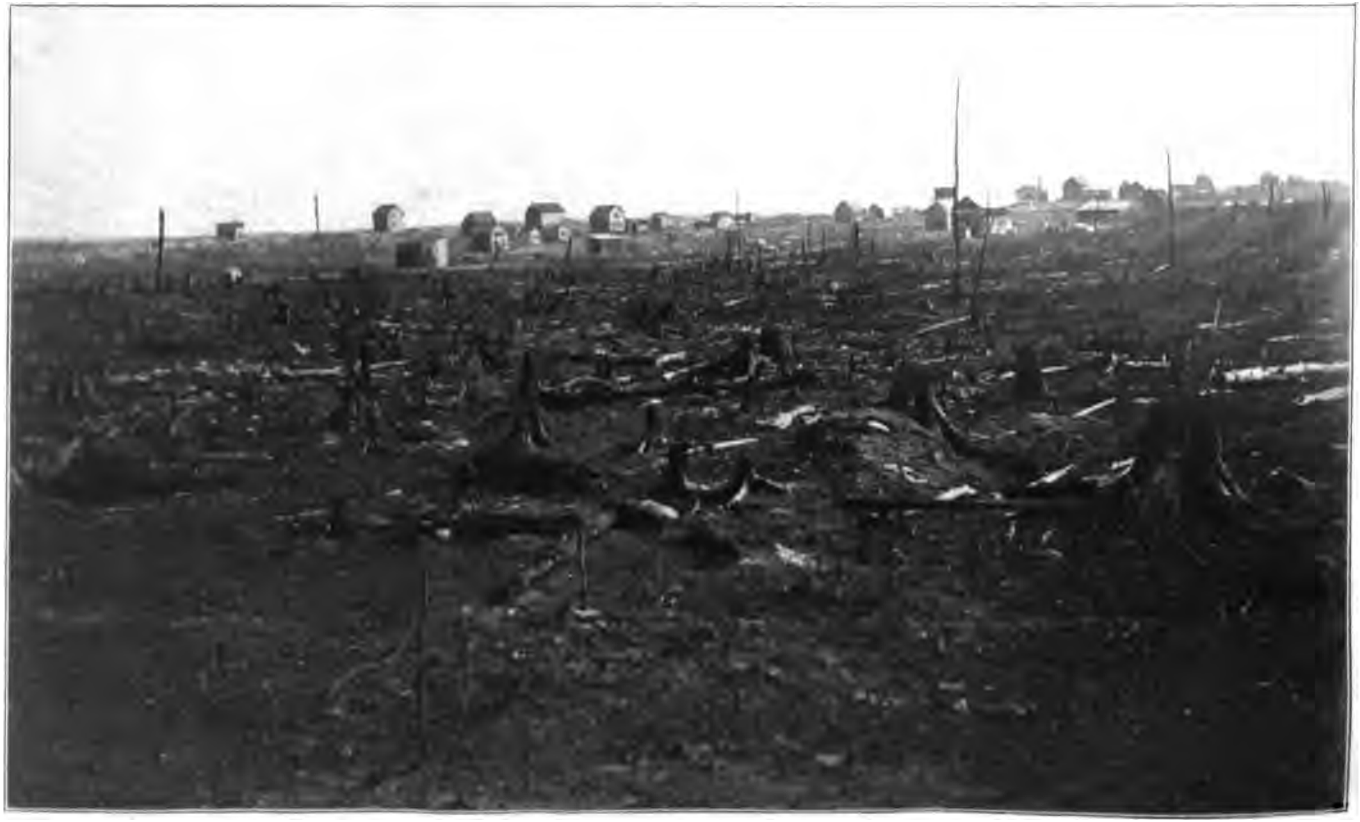
SUMMARY OF FOREST FIRES, 1908.—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
St. Louis Co.—Cont.					
Pike	Oct. 6	6	25	24	Unknown.
Prairie Lake	Sept. 6	2	75	11	Hunters.
Solway	May 11	350	slight	20	Fishermen.
Sturgeon	Sept. 11	300	100	3	Unknown.
Stuntz	Sept. 5	10,000	1,500,000	300	Fishermen.
Stuntz	Sept. 8	500	slight	200	Clearing land.
White	Sept. 8	6,000	1,500	63	Clearing land.
Township 50-18	Sept. 10	40	(?)	20	Unknown.
Township 50-19	May 1	2,000	500	2	Unknown.
Township 51-19	May 8	40	500	14	Unknown.
Township 61-16	May 9	80	75	5	Unknown.
Todd County—					
Birchdale	April 15	600	100	12	Unknown.
Burnhamville	April 13	80	15	1	R. R. locomotive.
Burnhamville	April 22	80	slight	.....	Clearing land.
Fawn Lake	April 15	500	500	4	Unknown.
Little Elk	April 18	1,400	200	20	Burning meadow.
Moran	April 14	800	200	7	Burning brush.
Turtle Creek	April 18	800	1,000	11	Unknown.
Wabasha County—					
Mazeppa	April 22	40	50	3	Unknown.
Wadena County—					
Bullard	April 14	3,600	75	17	Unknown.
Huntersville	April 21	12,000	4,000	37	From adj. town.
Leaf River	April 12	500	150	14	Unknown.
Leaf River	May 8	80	150	5	Clearing land.
Lyons	April 19	1,800	600	......	From adj. town.
Rockwood	April 12	800	100	10	R. R. locomotive.
Rockwood	April 18	1,400	500	36	Burning meadow.
Shell River	April 20	1,000	slight	......	Unknown.
Thomastown	April 12	200	200	5	Unknown.

Total acres burned over, 405,748. Damage, $2,003,633.

Classification of causes:

Burning brush, 15.
Burning meadow, 9.
Campers, 11.
Clearing land, 47.
Fishermen and hunters, 16.
From adjoining town, 17.
Railroad locomotives, 29.
Other causes, 6.
Unknown, 180.



Part of the tract of about twenty acres in the village limits of Chisholm, which was covered with tops and refuse (slashings), September 4, 1908, and which made the destruction of the village by fire possible. The valuable timber throughout that locality was cut several years ago. Unfortunately several of the leading citizens of Chisholm were absent at the State Fair at the time of the fire. Photographed for the Forestry Commissioner of Minnesota, October 2, 1908.

SUMMARY OF PRAIRIE FIRES, 1908.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Aitkin County—					
Jevne (field fire)	Oct. 12	40	300	40	R. R. locomotive.
Benton County—					
Langola	April 12	200	80	5	Fishermen.
Clay County—					
Elkton	April 16	30	100	2	Unknown.
Elkton	April 18	2,000	250	10	From adj. town.
Elkton	April 21	200	160	10	R. R. locomotive.
Elkton	May 7	200	500	3	R. R. locomotive.
Felton	May 4	250	600	6	R. R. locomotive.
Flowing	April 16	40	None	5	R. R. locomotive.
Flowing	April 19	500	400	8	Burning meadow.
Flowing	April 23	160	100	8	R. R. locomotive.
Flowing	May 5	300	300	3	Unknown.
Flowing	Sept. 7	300	200	50	R. R. locomotive.
Flowing	Sept. 21	350	60	9	R. R. locomotive.
Hawley	April 18	1,400	1,000	14	Unknown.
Hawley	Sept. 24	40	50	2	Hunters.
Moland	May 5	120	75	......	Clearing land.
Moland	May 4	350	None	20	R. R. locomotive.
Moland	Sept. 7	200	1,200	19	R. R. locomotive.
Moland	Oct. 12	100	700	9	Steam plow.
Morken	Oct. 12	600	800	6	Steam plow.
Riverton	April 18	5,000	1,000	22	Tobacco pipe.
Skree	April 20	3,500	3,500	25	Fm. t'n of Riverton.
Clearwater County—					
Winsor	Nov. 3	300	500	10	Burning grass.
Kittson County—					
Cannon	April 21	200	150	6	Unknown.
Caribou	April 10	2,000	400	5	Burning meadow.
Hazelton	April 21	2,700	65	23	Unknown.
Hazelton	May 10	200	None	8	Unknown.
Jupiter	April 21	600	25	20	From adj. town.
Norway	April 23	2,000	400	6	From adj. town.
Pelan	April 23	800	150	......	Unknown.
Skone	April 18	90	20	......	R. R. locomotive.
Skone	April 20	80	None	......	R. R. locomotive.
Skone	April 23	80	35	......	R. R. locomotive.
Skone	April 23	10	100	......	Burning stubble.
Marshall County—					
Comstock	April 21	1,800	750	12	Unknown.
Comstock	Nov. 3	1,000	None	......	Unknown.
Excel	April 21	200	800	......	Unknown.
Norman County—					
Grand Meadow	May 10	900	None	13	Burning pasture.
Hegen	Nov. 18	400	920	......	From adj. town.
Mary	Nov. 18	200	....	......	Burning pasture.

SUMMARY OF PRAIRIE FIRES, 1908—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Polk County—					
Helgeland	Nov. 3	1,300	100	3	Unknown.
Red Lake County—					
Black River	Aug. 16	6	35	7	Unknown.
Bray	April 21	1,800	None	......	Unknown.
Mayfield	April 19	500	250	......	Burning grass.
Sanders	April 23	2,500	550	8	Unknown.
Wyandott	April 20	300	10	4	Unknown.
Roseau County—					
Pohlitz	May 10	30	54	6	Burning fire-break.
Soler	Nov. 5	2,000	65	23	Unknown.
Stevens County—					
Everglade	Nov. 17	800	None	17	Unknown.
Swift County—					
Clontarf	April 13	2,500	1,500	14	R. R. locomotive.
Wilkin County—					
Andrea	May 8	4,000	1,000	......	Travellers.
Prairie View	April 23	600	....	10	R. R. locomotive.
Yellow Medicine Co.—					
Florida	April 4	100	500	25	R. R. locomotive.
Florida	April 14	350	1,500	23	Burning slough.
Fortier	April 22	900	250	34	Unknown.

Total acres burned over, 44,276.
Damage, $19,724.
Classification of causes:
- Burning grass or meadow, 8.
- Fishermen or hunters, 2.
- From adjoining town, 5.
- Railroad locomotives, 16.
- Other causes, 7.
- Unknown, 18.

ASH LAKE REGION IN ST. LOUIS COUNTY VISITED.

Five years ago I visited that part of the pine forest in the Ash lake region about twelve miles east of that lake. In that locality is some of the best white pine remaining in Minnesota. On my trip in June, 1908, I passed through that part of the forest which surrounds Ash lake, and which is about sixty miles north of Virginia.

In that region I think there may be 5,000,000,000 feet of pine standing which will be cut in the next ten years. The country from Ash lake to Rainy lake, traversed by the new Duluth, Rainy lake & Winnipeg road, is moderately undulating and watered by numerous streams, and, except a few swamps with stunted spruce, is richly covered with forest, mostly mixed with pine, cedar, spruce, birch, poplar and tamarack.

I would say that the greater part of the country would prove suitable for agriculture. On the line of this road just mentioned are already a few farming settlements; that at Ashawa, on the headwaters of the Littlefork river, especially shows several well cultivated farms and neat farm buildings. I saw many head of cattle, and, as there are numerous natural meadows, it will prove a good stock-raising country.

TRIP BY THE FORESTRY COMMISSIONER IN ITASCA COUNTY, NOVEMBER, 1908.

Starting from Grand Rapids early Thursday morning, I drove northeast to Thistledew lake, then turning southeasterly, arrived at Hibbing Saturday evening, in all a drive by carriage of about 105 miles. What was especially interesting on the trip was the immense pine forest, worth a million or more dollars, and as yet untouched by fire, situated in townships 60 and 61, ranges 21 and 22. I was six hours driving through these pine forests.

At Thistledew lake, about 60 miles by road a little east of north from Grand Rapids and in the northeasterly part of township 61, range 23, is the most beautiful pine forest scenery that I know of in Minnesota. There is an extensive, level tract of close standing, large, symmetrical and lofty Norway pines, the ground free from underbrush, 50 feet above and overlooking Thistledew lake, a handsome body of water about two miles in extent. It is too beautiful a tract of timber ever to be cut and should be acquired and held by the state, or some public spirited owner, for a park. I was informed that it belongs to a Canadian logging company. The waters of Thistledew lake appear to be tributary to Little Fork river, which flows into Rainy river.

For about 60 miles north of Grand Rapids the country, moderately undulating with frequent lakes, was for the most part originally covered with primeval pine timber which was mostly cut twenty or more years ago. The soil is a light sandy loam with some mixture of clay, and if cultivated with the use of capital and energy, will undoubtedly yield good crops; but it is hard for a man whose only capital is his hands and his health to bring such land under cultivation, I, years ago, advised that owners of this land should donate 40 acres out of every 160 acres to any good actual settler. In the town of Balsam Lake, which comprises four congressional townships and has only 30 voters, I passed eight or ten men working on a new piece of road, each man having a pair of good heavy horses, and was informed that each man received $2 a day for his labor and $3 a day for his team. On my remarking as to the expense of the work, one of these settlers replied: "But we have to pay 60 cents a bushel for oats." We have been accustomed to think that 30 cents a bushel was sufficiently high price for a oats. I was informed by one of the settlers that the tax collected on cut-over land averaged about $3 per 40 acres or a little over seven cents an acre. This is rather a high rate and ought to yield about $6,000 in a town of four congressional townships if all the taxes are paid.

GUIDE BOARDS NEEDED.

For a new country, perhaps the roads are as good as could be expected, but there is room for a great deal of improvement. I have often found inconvenience in my travels from lack of guide boards. In all this drive of over 100 miles I did not see three. The law requires the town officers to have guideboards erected, but the matter is generally neglected. One sometimes asks, Who is responsible for the enforcement of such laws?

During all of my second day's drive from early morning until dark, there was not, with the exception of a logging camp at the end of the first 17 miles and in charge of one man, a single inhabited stopping place, consequently we made our noon stop for lunch and to feed the team at an abandoned logging camp. There were extensive log buildings; also considerable ground which had once been under cultivation but abandoned.

WHAT NATURE IS DOING.

While, as I have said, a good deal of the land which I passed over is suitable for agriculture, there is also much that is only fit for the production of timber and should be acquired by the state and planted with pine. The large stumps show what it could produce in the way of timber; but left in its present condition, it is growing poorer every year. Land is one of our natural resources and the only way to conserve such resource is to have it produce a crop for which it is best adapted. Nature alone is now restocking only five per cent of this land with valuable kinds of timber.

EDUCATING PUBLIC OPINION.

The Minnesota law expressly requires the Forestry Commissioner to "disseminate information concerning forestry." This he tries to do by published reports, newspaper articles and by public addresses. The following are short reports of some of his addresses:

SHORT REPORT OF ADDRESS BY GEN. C. C. ANDREWS, FORESTRY COMMISSIONER, BEFORE THE HIGH SCHOOL AT BRAINERD THE AFTERNOON OF WEDNESDAY, OCTOBER 14TH, 1908.

The leading principles of forestry are that forest which is to be permanent should occupy only land that is too sandy, too hilly or too rocky for successful agriculture; that the forest when young should be crowded so as to promote height growth; that the cutting should be done so as to promote natural regeneration; and that the forest should be treated as an inviolable capital and no more be cut in a year or series of years than grows in the entire forest the same period.

There is no tree in the world in such universal demand as our white pine; as population and wealth increase the demand for our pine will increase; a fact which should make us consider how to preserve such a resource. It is very notable that in our climate this valuable tree will grow on land that is too hilly, too sandy or too rocky for farming. The pine which is cut in Minnesota in a single winter is worth, just as it stands in the woods, $6,000,000; when brought to the mills and sawed its value is increased to $12,000,000; and as it is worked up in the various industries its value goes on increasing,—labor getting the principal benefit. This illustrates how our forests contribute to the general wealth.

But the forest also affords indirect benefits. It enriches the soil. It lends beauty to scenery. It ameliorates climate. The temeperature of the forest is a little cooler in summer and a little warmer in winter than the temperature of the open country. The air of the forest, like that of the sea, is richer in ozone and healthier than that of open country. Through the humus of its soil it serves as a natural reservoir of moisture and helps to supply and regulate water flow. In summer it is a barrier to the hot south wind and in winter to the cold north wind.

Our pine forests in Minnesota are rapidly being cut and one of the urgent questions for the consideration of the people is what can be done for reforesting such of the lands in the state as are unfit for agriculture. There are a few million acres of such lands and competent foresters say that if planted with pine they would yield a handsome revenue. Experience of other countries proves this.

ADDRESS BY GEN. ANDREWS, FORESTRY COMMISSIONER, BEFORE THE ST. PAUL CHAPTER OF THE AMERICAN INSTITUTE OF BANKING, AT ST. PAUL, THE EVENING OF NOVEMBER 17, 1908.

Two winters ago a white pine was cut in Cass county, Minnesota, which, according to its rings, was 425 years old. It was six feet in diameter at the stump and yielded 6,000 board feet of lumber. Nature was several centuries producing the pine forests in Minnesota, now mostly consumed, and if man were to disappear, she would, in several centuries, restore them. We cannot wait that long. The science we call forestry must help her.

The original pine forests in Minnesota occupied an area of 18,000,000 acres, with belts of other kinds of timber and swamps and waste places interspersed. About $6,000,000 worth of this pine is now being cut annually and in a dozen or fifteen years all of it will practically be cut. Much of this denuded land will be used for agriculture, but there is considerable that is so hilly, rocky or sandy as to be only fit for the production of pine forest.

GREAT THING IN FORESTRY

The great thing in forestry is that it can convert such land into gilt -edged securities. This land is one of our natural resources, but in its present bare condition is yearly growing poorer. The state should buy it and put it in forest.

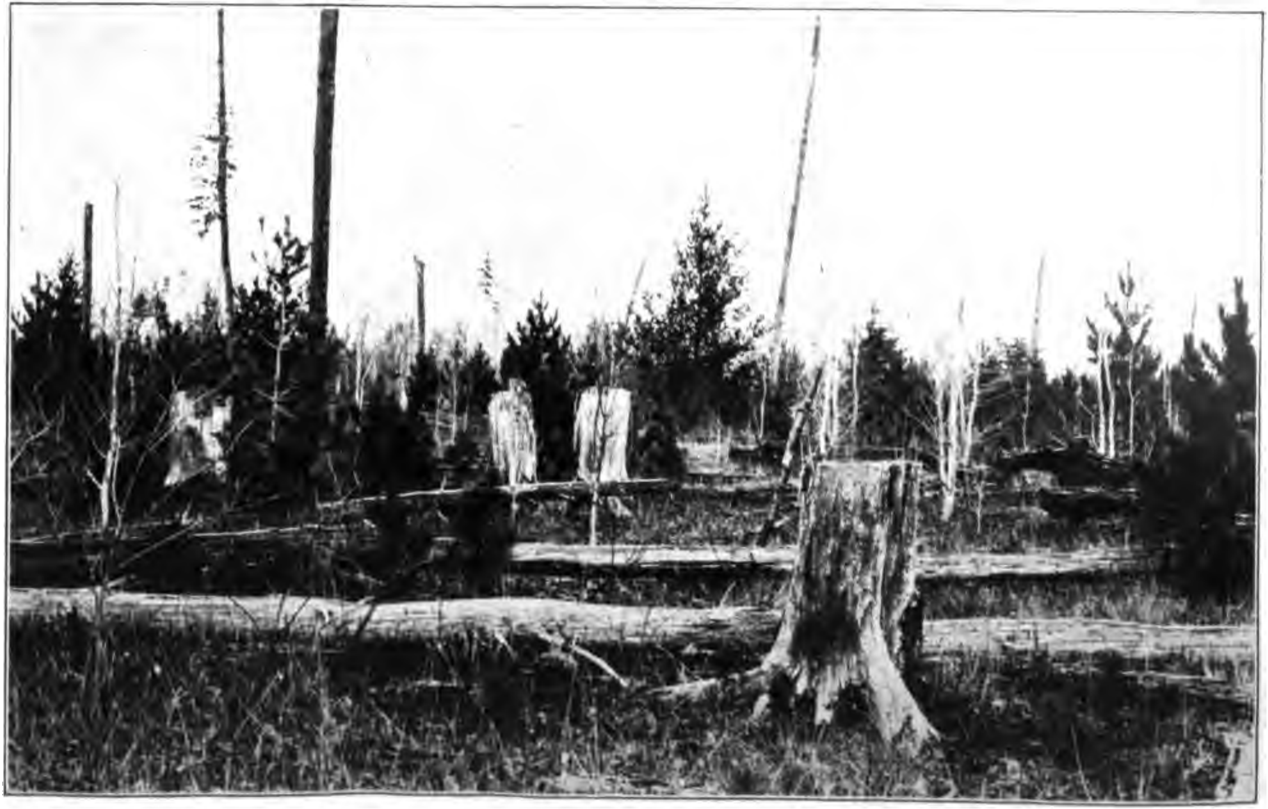
A normal forest is one containing trees of all ages and sizes, and from which enough can be cut yearly or periodically to afford regular revenue. For example, in the state forests of Saxony, comprising 432,000 acres of land not suitable for agriculture, it has been found that the average annual forest growth per acre is 225 board feet; consequently 97,000,000 board feet of timber can be annually cut for revenue, without impairing the capital. So much of the cleared area as had not become restocked with young growth from natural seeding, would immediately be planted, and the forest in this way be perpetuated.

Forestry looks for revenue. When a timber tree has ceased to earn good interest by its growth, it has reached its fiscal age and should be cut. The pine does its fastest growing the first eighty years of its life. It grows after that, but not at a rate to earn sufficient interest.

HOW TO PLANT TREES

In starting the work of reforestation, we obtain the seed of the pine from cones, or we buy the plants. A pound of white pine seed should yield 10,000 plants. When two or three years old, the plants are set out where they are to remain permanently, about four feet apart, because to produce tall trees free from limbs, the forest must be crowded when young. The shade causes them to shed their lower branches.

It might encourage some private owners to grow timber if their crop could be exempt from tax until cut. But the state, in such case, would have to be at expense in watching that the planting and maintenance of forest was in good faith and according to forestry principles. The better forestry authorities hold that the state should anyhow engage in reforestation. If Minnesota would now begin, on a suitable scale, to acquire and reforest such cut-over lands as are especially adapted for the production of timber, she could in eighty years have a normal forest of 3,000,000 acres, from which 675,000,000 feet of timber could be cut annually forever. Naturally some spruce would be grown and crops of that for pulp wood could be harvested in thirty years. This forest would add at least $200,000,000 of revenue-yielding wealth to the state. It would afford labor to thousands of employees, to hundreds of scientifically trained foresters, beautify our scenery, improve our climate, maintain water-flow in streams, afford covert for game and add glory to the state. The most intelligent people in Minnesota are anxious



Some natural reproduction of pine in town of Balsam, Itasca County, Minn., where primeval pine was cut about twenty years ago. Photographed November, 1908, for the Annual Report of the Forestry Commissioner of Minnesota.

to have this work commence. Our governor and legislature can start it, and the public is waiting to hear them give the command, "Forward, double-quick!"

SHORT REPORT OF ADDRESS BY FORESTRY COMMISSIONER ANDREWS BEFORE THE PUBLICITY CLUB OF MINNEAPOLIS, DECEMBER 16, 1908.

In his address General Andrews said in part:

Consumption of the pine forests in Minnesota has been going on for sixty years, and in a few years more this natural resource will be exhausted. Much of the cut-over pine land will be good for agriculture, but there are a few million acres that are too hilly, rocky or sandy for anything but the production of pine. The pine requires only one-twelfth of the mineral substance that is required for field crops. But it requires eighty years for the pine, planted as a seedling two years old on such land, to grow to merchantable size. Nature, unaided, has restocked only about 5 per cent of these cut-overs lands with valuable kinds of timber trees. Nature alone works too slow. The state must help her, and plant. Even in the state forests of Germany, where under scientific treatment of forests, natural regeneration has the best chance, more than 100,000 acres are every year artificially planted or sown. Prussia, alone, in her state forests yearly plants and sows 44,000 acres.

The Minnesota state forestry board has successfully planted 200 acres of pine and spruce, two or three-year-old seedlings, four feet apart, on cut-over land in Cass county, donated to the state by the late John S. Pillsbury. The forestry board desires to plant on a much larger scale. It ought to be planting thousands of acres every year, but it cannot do so until the legislature furnishes money to acquire the land and do the planting.

SHOULD GET SERIOUS ATTENTION.

The people should see that their members of the legislature give the forestry problem serious attention.

The success of scientific forestry in Germany for over a century shows what its benefits would be for us just as clearly as that two and two make four.

Horace Greely said: "The way to resume specie payments is to resume." So the way to begin reforestation is to begin.

There has been a law four years authorizing the forestry board to buy land and plant it with forest, but the legislature has not furnished a dollar to make it effective. There is no prospect of obtaining a suitable appropriation for this purpose.

The pine-forests in Minnesota, as the natural resource of a leading industry, will be exhausted in a dozen years. It would take centuries for nature alone to restore them. To grow pine, even to scant merchantable size—twelve inches in diameter breast high—on non-agricultural land will require eighty years. Individuals will not engage in this to any great extent. The state must do it. Every enlightened state in Europe maintains state forest. Prussia alone has 6,000,000 acres of state forest yielding a handsome net revenue of $9,000,000 annually. Nine German states have in the aggregate 8,000,000 acres of state forest yielding an average net revenue of $2.25 per acre annually. Not only do these forests yield regular revenue on the capital they represent and afford steady employment for many thousands of people, but they improve climate, beautify scenery, maintain waterflow in streams, improve soil, afford covert for game.

MINNESOTA'S NATURAL ADVANTAGES.

No state has better advantages for reforestation than Minnesota. Its material welfare and its rank for intelligence would both be greatly promoted by prompt commencement of the work. There are 3,000,000 acres of denuded land that is growing poorer every year, but which if reforested would make Minnesota the leading state in forestry. We look with admiration at great things elsewhere—the Panama canal—the great fleet—England's railroad six thousand miles through Africa. But what are we doing at home? What is our boasted university worth; what are our colleges, schools and newspaper press worth, if they have failed to create a public spirit that does things?'

NEW LEGISLATION

As before stated the appropriation of $5,000 a year under the revised Laws to pay the expense of preventing and suppressing forest or prairie fires, "in any season of unusual drought" was exhausted in October, and additional claims for similar services in the fall of 1908 to the amount of $12,500 had been received at this office up to the close of the year. A bill to appropriate money to pay these claims was introduced at the beginning of the session of the legislature which met January 1909, but did not pass till near the close of the session. The claims were paid by the first of May.

The Minnesota legislature of 1909 enacted several laws relating to forestry and considerably strengthened the law for the prevention of forest fires. The text of these laws will be found in this report; and the following is a synopsis of the different sections of chapter 182, Session Laws 1909, relating to the prevention and extinguishment of forest and prairie fires.

FIRE WARDENS

Town clerks are added to the list of fire wardens. Wardens are held responsible that their districts are exempt from dangerous forest and prairie fires. The forestry commissioner may appoint additional wardens whenever he deems it necessary. Wardens are to divide their towns into districts and assign one of their number to each district. They shall take energetic precautions to prevent fires. They are to post warning notices within ten days after receiving the same; give verbal warning and take other suitable precautions for the prevention of fires; report fires within three days after they occur; when they have information of the violation of the law they shall without delay make complaint before a magistrate and endeavor to have the case vigorously prosecuted.

RANGERS

The forestry commissioner is to appoint rangers for the territory exposed to forest and prairie fires who are to be paid not exceeding $5 per day and necessary and reasonable travelling expenses. The rangers have the power of fire wardens and shall quickly go over their districts to see that fires are prevented and extinguished and to inspect, assist or compel the activity of local wardens. In the employment of rangers preference shall be given to woodsmen, game wardens and forestry students who are known for reliability and efficiency.

EMERGENCY APPROPRIATION

In any dry and dangerous season the commissioner may use such means as he shall deem necessary to prevent or suppress forest and prairie fires, the cost whereof, not exceeding $14,000 in any one year, shall with the approval of the state auditor and forestry commissioner be paid by the State. The bill as introduced and as it passed the House of Representatives appropriated $28,000 for this purpose, but it was cut down in the Senate to $14,000. In addition $2,000 are allowed annually for prosecutions. These amounts, making $16,000 in all as an emergency fund are appropriated annually.

PAY OF FIRE WARDENS

The pay of fire wardens is raised to twenty-five cents per hour and actual and necessary travelling expenses. An employe or patrol is paid at the rate of twenty cents per hour. For forest preservation including the compensation and expenses of the forestry commissioner's department and one-half the pay in an ordinary year of fire wardens and of persons assisting in preventing and suppressing forest and prairie fires (the counties in which the fires occur in an ordinary year paying the other half) there is annually appropriated $5,000.

INCREASE OF MINIMUM PENALTY

The minimum penalty for the violation of the forest fire law is made $50.

CAMP FIRES

A provision was borrowed from the Ontario law in respect to camp fires. Every person who in a dry season starts a camp fire in the vicinity of forest or prairie land, must before lighting the same, clear the ground of combustible material within a radius of ten feet from the fire and carefully extinguish the fire before quitting the place.

CIRCUMSTANTIAL EVIDENCE

When it shall be shown in evidence from the appearance of the track of the fire that a fire that spread to the land of another had its origin on a tract upon which at any time within three weeks previously to such spreading, the owner or occupant of the land or his agent was using fire in clearing land or otherwise, the same shall be prima facie evidence that such owner, occupant or agent was guilty of having by negligence caused such fire to spread, and on conviction shall be deemed guilty of a misdemeanor. In a criminal prosecution the evidence must be sufficient to prove beyond a reasonable doubt that the accused is guilty and circumstantial evidence is sometimes stronger than direct testimony.

DUTIES OF ROAD INSPECTORS

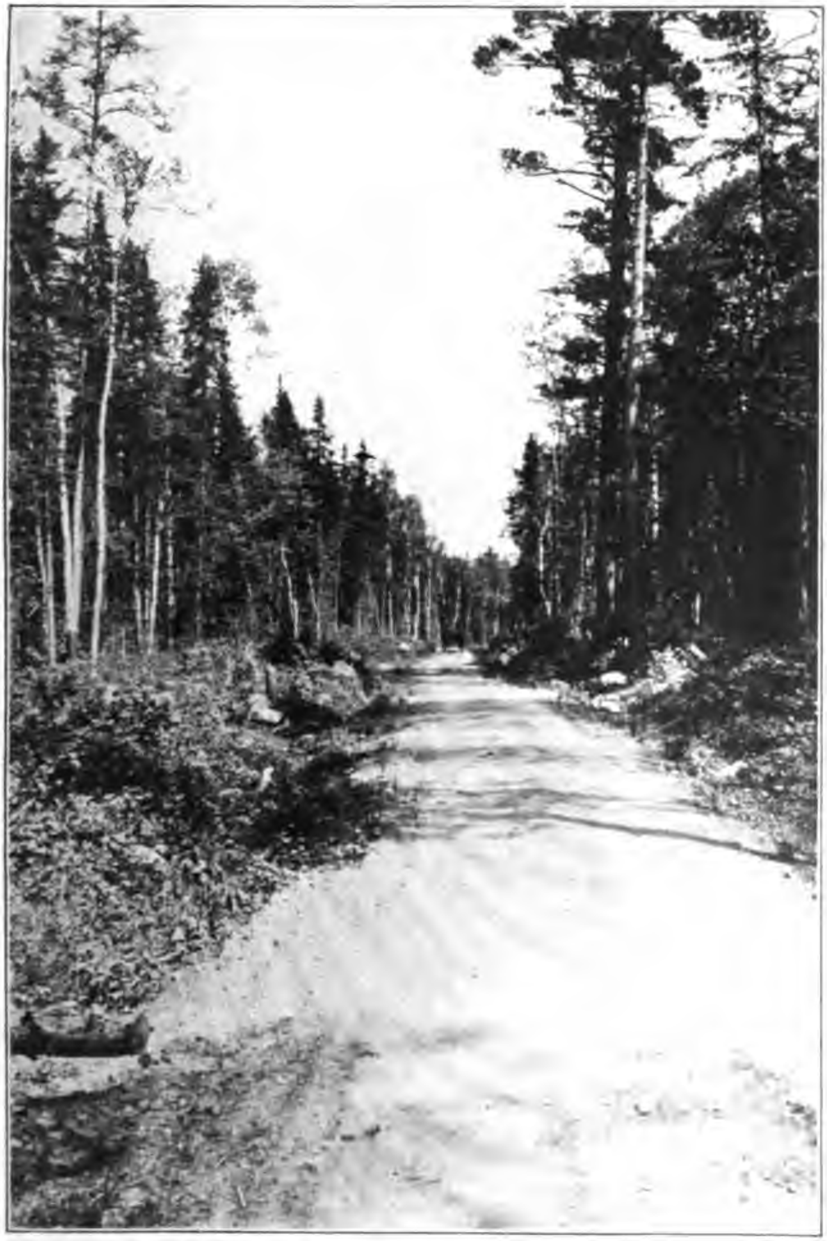
An officer having charge of a highway during a dry season who has reason to believe that any traveller has left a camp fire on any roadside in his district must without delay go to the place of such camp and if he finds fire extinguish it and take measures to prosecute the person who left it.

BURNING SLASHINGS

Anyone who cuts wood or trees for commercial purposes must pile and under charge of a competent person or persons burn the slashings,—branches, tops and refuse—the burning to be done as soon as practicable at a time when it can be done without danger and before the first day of May next following. As soon as practicable; this means doing it just as soon as a prudent person acting in good faith would do. Every one knows that a dry season may happen or at least that dry and windy weather may happen; and he knows he cannot burn slashings then; he is therefore to do it as soon "as practicable." He will do the work as cutting progresses and not let it accumulate. This is the way slashings are burned in the Minnesota National Forest and that is the way slashings will have to be burned under this new law. Of course this provision applies to slashings made after the law took effect which was the 13th of April, 1909. As to slashings made before the law went into effect, or brush or other combustible material, there is a provision that all such material must be piled before being set on fire. Furthermore, everyone is prohibited from setting fire to brush or other combustible material in a dry season or allowing fire to be burning or smouldering on his land in any such season.

COUNTY ATTORNEYS AND MAGISTRATES

Section 1787e of the new law relating to the responsibility of county attorneys and magistrates was borrowed from the state of Washington. When information of violation of the law has been lodged with the county attorney and he fails to prosecute the accused with diligence and energy, he is guilty of malfeasance in office, liable to be removed and disqualified from holding the same during the remainder of the term for which he was elected or appointed and shall forfeit not less than $100. The same penalties apply to any magistrate with proper authority who neglects to cause the arrest and prosecution of any person when complaint has been duly made.



Good road in northwestern part of St. Louis County, Minn., in pine, spruce and some hardwood forest. Photographed for Annual Report of Forest Commissioner of Minnesota, June, 1909.

RAILROAD COMPANIES

Some stringent new provisions have been enacted affecting railroad companies. In a dry season a railroad company must employ at least one patrolman for each mile of its road through lands liable to be overrun by fire; engineers, conductors or trainmen discovering fire adjacent to the track must report the same promptly at the first telegraph or telephone station reached. When the fire occurs near the line of its road the company must have it extinguished. "Near the line of the road" is defined a distance within which a fire could usually be set by sparks from passing locomotives. Locomotive engineers and master mechanics are held responsible for the good condition of the spark arresters but without relieving the company from its responsibility. The minimum penalty for violation of any of these provisions is $50.

The text of the new law is hereunder printed and it deserves the careful study of all those who are responsible for its enforcement. It is unquestionably the most stringent law against forest fires that any state now has.

FOREST FIRE LAW OF MINNESOTA.

CIRCULAR No. 32.

STATE OF MINNESOTA,
OFFICE OF FORESTRY COMMISSIONER,

ST. PAUL, Minn., April 14, 1909.

Chapter 22, Revised Laws, Minnesota, 1905, and Chapter 182, Session Laws, 1909, amending the same, for the prevention and extinguishment of forest and prairie fires, are as follows:

Commissioner. 1781. The state auditor shall appoint a forestry commissioner, to hold office during his pleasure, whose salary shall be fifteen hundred dollars per annum, payable monthly out of the appropriations for forest preservation. He shall be a member of the forestry board, have immediate supervision of the several fire wardens, disseminate information concerning forestry, and enforce the laws relating thereto, and to the prevention of forest and prairie fires.

Wardens. Their Duties. 1782. The supervisors and clerks of towns, mayors of cities and presidents of village councils are hereby constituted fire wardens for their respective districts, and shall be held responsible that their districts are exempt from dangerous forest and prairie fires. Upon request of the commissioner, county auditors shall immediately furnish the names and address of the chairmen of town boards, the names of towns, and the numbers and ranges of the township in each, in their respective counties. The commissioner may appoint fire wardens for unorganized territory, and additional wardens wherever he may deem necessary; and he may direct any warden to perform duties at a point outside of his district. The wardens shall enforce the provisions of this chapter. They shall divide their town into districts and assign one of their number to each district. In case of absence from their districts in dry seasons, they shall designate someone to act in their place; also notify the warden of the adjoining district. They shall take energetic precautions to prevent forest and prairie fires, visit all parts of roads, trails, camps and frequented places, warn campers or other users of fire, and extinguish small or smouldering fires. They shall patrol their districts in dry seasons, immediately inform the commissioner when there is need of patrolling, and, with the approval of the commissioner, employ patrols to guard against carelessness in the use of fire. They shall, within ten days after receiving the same, post warning notices furnished them by the commissioner, give verbal warning, when they deem it necessary, against causing fires, and take all other suitable precautions for the prevention of fires. They shall take measures to suppress or control fire they have reason to think is being neglected in any adjoining or neighboring district or town. They shall promptly investigate each forest and prairie fire within their respective districts, follow the track of the fire to the place where it started, fix responsibility therefor, if possible, and within three days report the cause thereof, the property destroyed, its value, the lives lost, if any, the means used to combat such fire, and any additional facts required by the commissioner. They shall make such other reports as he may require, and promptly comply with his instructions. Each warden shall co-operate with the warden in any adjoining district or town, and in his absence assume control therein. Each may arrest, without a warrant, any person found violating any provision of this chapter, and take him before a magistrate, and there make complaint; and when a warden shall have information that such violation has been committed, he shall, without delay, make similar complaint and endeavor to have the case vigorously prosecuted. He shall not be required to give security for costs of prosecution, nor to pay any cost of prosecution. Wardens shall go to the place of danger to control or prevent fires, and in emergencies may employ or compel assistance.

Rangers.

1782a. The commissioner shall divide into districts the territory exposed to forest or prairie fires, and, in a dry and dangerous season, employ for each district a ranger, who shall have the power and perform the duties of fire wardens, go quickly over his district to see that fires are prevented or extinguished, and shall inspect, assist or compel the activity of local wardens. He shall by frequent reports keep the commissioner informed of his movements. He shall inform himself of the location of timber belonging to the state and use efforts to protect it from fire and trespass. In the employment of rangers, preference shall be given to cruisers or woodsmen, game wardens and forestry students who are known for reliability and efficiency. Each shall perform service in any district to which he is assigned. Rangers shall be paid for their services by the state out of the emergency fund. on verified vouchers, approved by the commissioner, at the rate of not exceeding five ($5.00) dollars per day for the time actually employed and necessary and reasonable travelling expenses, and for which receipts shall be attached to their vouchers, the same to be filed in the State Auditor's office.

Commissioner's Duties.

1783. The commissioner shall investigate the state forests, and the causes and effects of fire therein; the quantity and character of the timber, and methods used to promote its regrowth, and other facts relating to forest interests. He shall report to the auditor annually touching his official acts, making such recommendations as he shall deem proper. He shall co-operate with any force of the United States which may be detailed to protect property from fire. He shall prepare an abstract of the penal laws relating to forest and prairie fires, together with proper regulations and suggestions for the prevention and control thereof, and before April 1 in each year shall forward printed copies to all fire wardens, railroad companies and chairmen of county boards. The wardens shall post such abstract in numerous conspicuous places in their respective districts, and the commissioner may require any county board to cause at least three weeks' published notice thereof to be given.

Notices.

Dangerous Season.

1784. In any dry and dangerous season, the commissioner may use such means as he shall deem necessary to prevent or suppress forest and prairie fires the cost whereof, not exceeding fourteen thousand dollars in any one year, shall with approval of the state auditor and forestry commissioner, be paid by the state. And whenever the local officials shall neglect to prosecute violators of any law relating to forest and prairie fires, the commissioner shall prosecute the same, and the cost of such prosecution, not exceeding two thousand dollars in any year, shall be paid by the state. Sixteen thousand dollars, as an emergency fund, or so much thereof as may be necessary, are hereby appropriated annually for the purposes of this section.

Prosecutions.

Warden's Pay.

1785. Each fire warden shall be paid for actual service at the rate of twenty-five cents per hour and actual and necessary travelling expenses, and each employee or patrol at the rate of twenty cents per hour. A fire warden or employee shall receive pay for use of team when plowing for the control of a fire or in hauling water. In an ordinary season the expense incurred for fire warden service and in suppressing fires shall be paid out of the state treasury on duly verified vouchers, approved by the proper town board and the commissioner; and one-half (½) the amount shall be reimbursed to the state by the county in which the expense occurred. The state auditor shall notify the proper county auditor of the one-half (½) amount that has become due from his county under the foregoing provisions, and such county auditor shall immediately draw and transmit to the state auditor a warrant on the county treasurer of his county in favor of the state for such amount. For forest preservation including the compensation and expense of the forestry commissioner's department and one-half the pay, in an ordinary year, of fire wardens and of persons assisting in preventing and suppressing forest and prairie fires, there is hereby annually appropriated out of any money in the treasury, not otherwise appropriated, the sum of five thousand dollars, or so much thereof as may be necessary.

Portable Engines.

1786. Every person operating a threshing or other portable engine shall keep effective spark arresters thereon while in use, and no person shall deposit coals or ashes therefrom without safely covering or extinguishing the same. Every violation of any provision of this section shall be deemed a misdemeanor.

Penalty for Neglect of Duty and for Causing Fires.

1787. Every warden or patrol, and every person lawfully commanded to assist in enforcing any of the provisions of this chapter, who shall unjustifiably refuse or neglect to perform his duty; every person who shall kindle a fire on or near forest or prairie land and leave it unquenched, or be a party thereto, or who shall set fire to brush, stumps, dry grass, field stubble or other material and fail to extinguish the same before it has endangered the property of another; every person who shall negligently or carelessly set on fire, or cause to be set on fire, any woods, prairie, or other combustible material, whether on his own land or not, by means whereof the property of another shall be endangered, or who shall negligently suffer any fire upon his own lands to extend beyond the limits thereof; every person who shall use other than incombustible wads for firearms, or carry a naked torch, fire-brand, or exposed light in or near forest land, or who in the vicinity of such land shall throw or drop into combustible material any burning match, ashes of pipe, lighted cigar or any other burning substance, and who fails to immediately extinguish the same, and every person who shall deface, destroy or remove any abstract or notice posted under this chapter, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by fine of not less than fifty dollars and not exceeding one hundred dollars and costs of prosecution, or by imprisonment in the county jail not less than thirty days and not exceeding ninety days, or by both fine and imprisonment. Any person who maliciously sets on fire, or causes to be set on fire, any woods, prairie, or other combustible material, whereby the property of another is destroyed and lives sacrificed, shall be punished by a fine of not over five hundred dollars, or be imprisoned in the state prison for a term not exceeding ten years, or both such fine and imprisonment.

Camp-Fires.

1787a. Every person who, in a dry season, starts a camp or other fire in the vicinity of forest or prairie land, for cooking, obtaining warmth or for any industrial purpose, shall exercise every reasonable precaution to prevent such fire from spreading, and shall, before lighting the same, clear the ground from all branches, brushwood, dry leaves or other combustible material within a radius of ten feet from the fire, and shall carefully extinguish the fire before quitting the place.

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1787b. When it shall be shown in evidence from the appearance of the track of fire, or otherwise, that a fire, which spread from the land of one owner or occupant to land of another, had its origin on a tract upon which, at any time within three weeks previously to such spreading, the owner or occupant of the tract or his agent or any employee was using fire in clearing land or otherwise, the same shall be prima facie evidence that such owner, occupant, agent or employee was guilty of having by negligence caused such fire to spread, and on conviction he shall be deemed guilty of a misdemeanor. No appeal shall be allowed from a judgment in justice's court in any prosecution under this chapter unless the person appealing shall, within the legal time prescribed, enter into a recognizance with two sufficient sureties, surety company or cash bail, in twice the amount of the fine and costs, to be approved by the justice, conditioned to appear before the district court on the first day of the general term thereof next to be held in and for the same county, and abide the judgment of said court therein. The justice may examine the proposed sureties under oath, and in such case shall make and keep a record of their answers in respect to the kinds and amount of their property that is not exempt from execution, and furnish a copy of the same to the commissioner.

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1787c. Every road inspector or assistant of a road inspector, or other officer having charge of the highway, who during a dry season has reason to believe that any traveler or wayfarer has left a camp-fire on any roadside in his district, shall without delay go to the place of such camp, and examine whether any fire has been left burning or smouldering; and if he finds fire in any such camp, he shall extinguish the same, also take prompt measures to prosecute the person or persons who so left such fire. It shall be the duty of every such highway officer, when requested by the warden, to render every assistance possible in preventing or extinguishing fires, and his pay for actual service shall be the same as that of a warden.

Slashing

1787d. Any person or corporation who cuts or fells or causes to be cut and felled timber or wood or trees of any kind for commercial purposes shall pile, and under charge of a competent person or persons burn the slashings (by which is meant the branches, tops and refuse). Said burning shall be done as soon as practicable at a time when it can be done without danger and before the first day of May next following. It shall be the strict duty of each fire warden, under the orders of the commissioner, to see that the provisions of this section are faithfully complied with. Any person or corporation who cuts or fells trees or bushes in clearing land for roadbed or right of way for any railroad, highway or trail, shall in the same manner pile and burn the slashings, and all combustible material except fuel and merchantable timber. In every above instance of piling and burning, care in proportion to the danger shall be exercised to prevent injury to remaining standing timber or woods. Any person or corporation who cuts or fells trees or bushes in clearing land for agricultural or pasturage purposes is prohibited from setting fire to the slashings, brush, roots or excavated stumps or other combustible material on such land before having piled the same. Every owner or occupant of land is prohibited from setting fire to any such slashings, brush, roots, stumps (whether excavated or otherwise), or other combustible material in a dry season, and is prohibited from using fire or allowing fire to be burning or smouldering on such land in any such season. Any person or corporation who violates any of the foregoing provisions of this and the three preceding sections shall be deemed guilty of a misdemeanor, and, on conviction thereof, be punished for each offence by fine not less than fifty dollars nor more than one hundred dollars and costs of prosecution, or imprisonment in the county jail not less than thirty days nor more than

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Informers. ninety days. The person other than the forestry commissioner upon whose complaint a conviction is had for violation of any of the provisions of this chapter shall be entitled to one-half the fine recovered upon sentence therefor.

County Attorneys' and Justices' Liability. 1787e. Whenever an arrest shall have been made for violation of any of the provisions of this chapter, or whenever information of such violation shall have been lodged with him, the county attorney of the county in which the criminal act was committed shall prosecute the accused with all diligence and energy. If any such county attorney shall fail to comply with the provisions of this section, he shall be guilty of a malfeasance in office, and shall be removed therefrom, and be disqualified from holding the same for and during the remainder of the term for which he was elected or appointed, and shall forfeit not less than one hundred dollars nor more than five hundred dollars, which amount may be recovered in an action against him personally or on his official bond. The penalties of this section shall apply to any magistrate with proper authority who refuses or neglects to cause the arrest and prosecution of any person or persons when complaint under oath of violations of any provisions of this act has been lodged with him.

1788. All fines collected for violations of this chapter shall be paid into the treasury of the county in which the conviction occurs and become a separate fund for defraying the cost of enforcing the provisions hereof in such county. [But see last part of Section 1787d, where half the fine goes to informer.]

Duties of R. R. Companies. 2035. Every company operating a railroad shall use upon each locomotive engine a good and efficient spark arrester, which the master mechanic shall cause to be examined, and the same shall be examined by the locomotive engineer, each time before leaving round house, and the master mechanic and locomotive engineer shall be held responsible for the good condition of the same, but without relieving the company from its responsibility hereunder. Every such company shall keep its right of way clear of combustible materials, except ties and other material necessary for the maintenance and operation of the road, from April 15 to December 1. No company shall permit any of its employes to leave a deposit of fire, live coals, or ashes in the immediate vicinity of woodland or lands liable to be overrun by fire, and every engineer, conductor or trainman discovering fire adjacent to the track shall report the same promptly at the first telegraph or telephone station reached by him. In dry seasons every such company shall give its employees particular instructions for the prevention and extinguishment of fires, and shall cause warning placards furnished by the forestry commissioner to be conspicuously posted at every station in the vicinity of forest and grass lands, and, when a fire occurs near the line of its road, shall concentrate such help and adopt such measures as shall be available for its extinguishment. **Patrols.** In dry seasons every such company shall employ at least one patrolman for each mile of its road through lands liable to be overrun by fire to discover and extinguish fires occurring near the line of the road, by which is meant a distance within which a fire could usually be set by sparks from a passing locomotive. Any company violating any provision of this section **Penalty.** shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be fined not less than fifty dollars and not exceeding one hundred dollars and costs of prosecution for each offence, and any railroad employe violating the same shall be guilty of a misdemeanor, and shall be punished by a fine of not less than fifty dollars nor more than one dundred dollars and costs of prosecution, or by imprisonment in the county jail not exceeding ninety days.

Approved April 13, 1909.

DEFICIENCY APPROPRIATION FOR FIGHTING FIRES, 1908

Following is the act which appropriated $12,600 for fighting forest fires in 1908:

AN ACT to appropriate money to pay the expense of preventing and suppressing forest and prairie fires in 1908.

WHEREAS, the appropriation for five thousand dollars for the present fiscal year provided by section 1784 of the Revised Laws of Minnesota, 1905, to enable the forestry commissioner to prevent or suppress forest and prairie fires in a season of unusual drought, has become exhausted and accounts of various persons for services in suppressing principally forest fires in such season in 1908, to the amount of twelve thousand four hundred and two dollars and five cents ($12,402.05) are unpaid, therefore

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. There is hereby appropriated out of any money in the treasury not otherwise appropriated, the sum of twelve thousand and six hundred dollars ($12,600), or so much thereof as may be necessary, to pay, provided that before any of the funds provided for hereunder shall be paid to any person claiming the same, the state auditor shall satisfy himself that the alleged services were actually rendered and were of the value claimed, for services in preventing and suppressing forest or prairie fires during the season of unusual drought in 1908.

SEC. 2. This act shall take effect and be in force from and after its passage.

Approved March 30, 1900.

FOREST RESERVES FUND

When the Forestry Board was organized in 1899 there was a provision in the law that the expenses of the Board should be limited to $1,000 per annum. Naturally as the work of the Board increased, its expenses increased. The following act was intended to repeal the $1,000 limitation and also to turn into the forest reserves fund the $1,000 which for some years has been annually appropriated to perfect tax title lands that were expected to be acquired for forestry purposes. There being no tax title lands available for forestry purposes it was desired to make this money a part of the forest reserves fund.

AN ACT relating to the forest reserves fund and the Forestry Board's expenses.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. The sum of one thousand dollars appropriated by section 2513, Revised Laws of Minnesota, 1905, for paying the expenses incurred in bringing actions together with any money which the forestry board may turn into the state treasury, is hereby constituted a part of the forest reserves fund, provided by section 2508 of said Revised Laws, and the proper and necessary expenses of the Forestry Board shall be paid out of said fund.

SEC. 2. All acts and parts of acts inconsistent with this act are hereby repealed.

SEC. 3. This act shall take effect and be in force from and after its passage.

Approved March 19, 1909.

ENLARGEMENT OF ITASCA STATE PARK

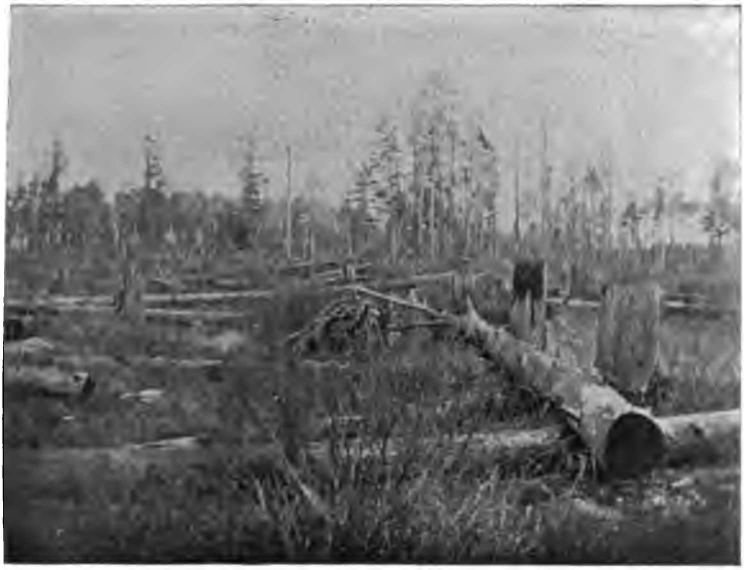
There is a standing appropriation of $5,000 annually for the purchase of lands in the limits of Itasca State Park. This appropriation had so accumulated that the State through the Forestry Board in 1908 acquired by condemnation proceedings 497 acres with timber thereon, much thereof being splendid original pine forest bordering the main road, for $41,322.55. It also purchased at private sale 40 acres with timber thereon for $450.

By the following act the state will acquire about 3,000 acres with some timber by paying taxes on the land to the amount of $800 annually for a period of not exceeding ten years:

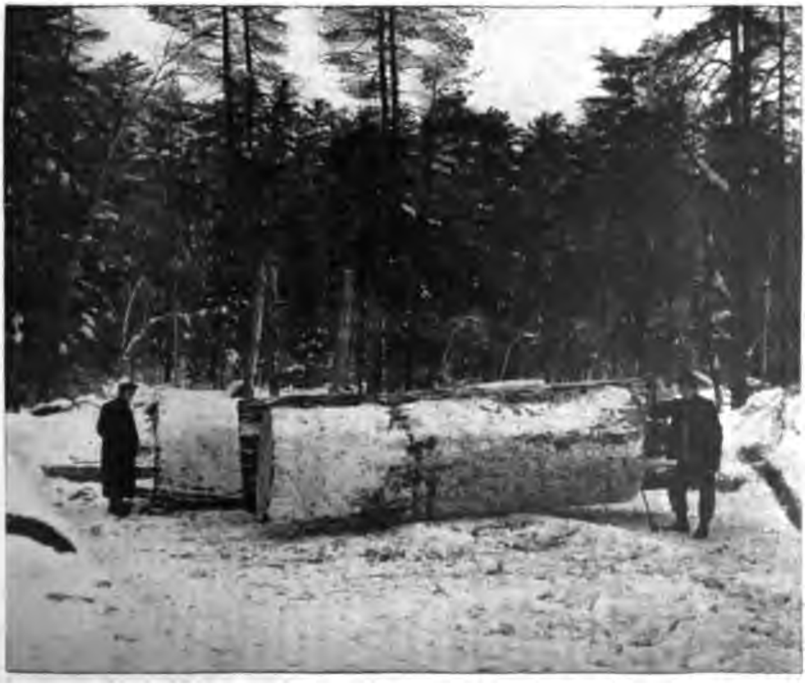
AN ACT authorizing the State Forestry Board to make certain contracts and to provide for the payment by the State of Minnesota of the taxes on certain lands in Itasca State Park.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. The State Forestry Board is hereby authorized to accept for the State of Minnesota donations of the hereinafter described land within the limits of the Itasca State Park, and such donors may reserve to themselves the right to cut and remove from the said lands all the white pine, Norway pine, jack pine, spruce,



Food for Forest Fires. Sample of country on the White Earth Chippewa Indian Reservation, where the United States Government lumbered for the Indians a few years ago, in a splendid forest of Norway pine. Shows a lack of forestry methods. Photographed for the annual report of the Forestry Commissioner of Minnesota.



White Pine cut in Cass County, Minn., on section 35, township 145, range 30 in the limits of the Minnesota National Forest, December, 1906. The age of the tree was 425 years; diameter at stump 6 feet. It yielded five logs containing 6,300 feet board measure. This is the largest White Pine in Minnesota of which there is any record. Photograph furnished by Mr. G. F Marshall, U. S. Forest Service.

cedar, tamarack and balsam timber eight inches in diameter and over and four feet and six inches from the ground at the time of cutting; and that the donors of the said land may reserve the right to cut and remove the timber growing on said land for a period not exceeding ten years from the date of such donation.

SEC. 2. All the taxes levied on such timber which the donors may reserve to themselves under this act shall be paid by the State of Minnesota for a period not exceeding ten years and the said donors shall have the right to drive their logs through Itasca Lake with two foot head of water during such period of ten years for the purpose of getting the timber cut on such lands to market. In addition to the right given to the State Forestry Board under this act, they shall reserve to the State and it shall be part of the agreement under which such donation is made that the said State of Minnesota by its said Forestry Board shall have the right to select such groves of timber as it may wish to preserve, to mark such groves and the trees therein with copper nails or white paint at the expense of the donors, and to pay the purchase price for the stumpage selected, which price shall be the same as that awarded the Red River Lumber Company according to size: Provided, that the State Forestry Board shall have the right to make partial payments for any standing timber which the Forestry Board may purchase from said donors.

SEC. 3. There is hereby annually appropriated out af any money in the State treasury not otherwise appropriated, the sum of eight hundred dollars ($800.00) per annum, or so much thereof as may be necessary for the payment of the taxes on any timber that may come under the provisions of this act.

SEC. 4. The lands referred to in section one (1) of this act are situated in Itasca Park in Becker, Hubbard and Clearwater counties in this state and are described as follows:

BECKER COUNTY.—Lots numbered one (1), two (2) and three (3) and the south half of northeast quarter (S. ½ N. E. ¼), the northwest quarter of southwest quarter (N. W. ¼ S. W. ¼), the west half of southeast quarter (W. ½ S. E. ¼) and the southeast quarter of southeast quarter (S. E. ¼ S. E. ¼) of section one (1) and lots numbered two (2), three (3), nine (9) and ten (10) of section three (3), all in township one hundred forty-two (142) north of range thirty-six (36) West.

HUBBARD COUNTY.—Lots numbered one (1), two (2), three (3) and four (4) and the southeast quarter (S. E. ¼) of section thirty-one (31), township one hundred forty-three (143) north of range thirty-five (35) West.

CLEARWATER COUNTY.—The northwest quarter (N. W. ¼) and south half (S. ½) of section nine (9); west half of northwest quarter (W. ½ N. W. ¼) and lots numbered five (5), eight (8) and nine (9) of section fifteen (15); west half of northeast quarter (W ½ N. E. ¼), north half of northwest quarter (N. ½ N. W. ¼), southeast quarter of northwest quarter (S. E. ¼ N. W. ¼), southeast quarter of southwest quarter (S. E. ¼ S. W. ¼), northwest quarter of southeast quarter (N. W. ¼ S. E. ¼),and the south half of southeast quarter (S. ½ S. E. ¼) of section twenty-one (21); lots numbered one (1), two (2), and three (3) and the east half of southwest quarter (E. ½ S. W. ¼), southwest quarter of southeast quarter (S. W. ¼ S. E. ¼) of section twenty-three (23); north half of northwest quarter (N. ½. N. W. ¼) southwest quarter of northwest quarter (S. W. ¼ N. W. ¼) and southeast quarter (S. E. ¼) of section twenty-five (25) southeast quarter of northeast quarter (S. E. ¼ N. E. ¼), north half of southeast quarter (N. ½ S. E. ¼), southeast quarter of southeast quarter (S. E. ¼ S. E. ¼) and west half (W. ½) of section twenty-seven (27); lot numbered one (1) of section thirty-three (33) and the north half of northeast quarter (N. ½ N. E. ¼) north half of northwest quarter (N. ½ N. W. ¼), southwest quarter of northwest quarter (S. W. ¼ N. W. ¼), northeast quarter of southwest quarter (N. E. ¼ S. W. ¼) and northeast quarter of southeast quarter (N. E. ¼ S. E. ¼), of section thirty-five (35), all in township one hundred forty-three (143) north of range thirty-six (36) West, together with such other lands in Itasca Park in addition to those above named as may be donated to the State by the Pine Tree Lumber Company under the provisions of this act.

SEC. 5. This act shall take effect and be in force from and after its passage.

Approved April 17, 1909.

IMPROVEMENTS IN ITASCA PARK

The general appropriation bill appropriated the sum of $5,000 for the care and maintenance of Itasca State Park for each of the fiscal years ending July 31, 1910 and July 31, 1911.

For improvements and repairs of Douglas Lodge and for grading and clearing land about Itasca State Park buildings, for the year ending July 31, 1910, $4,500.

For improvement of the State road through Itasca State Park from Bagley to Park Rapids, to be expended under direction of the state Highway Commission, there was appropriated $10,000, for the year ending July 31, 1910 only

FORESTRY INSTRUCTION

The following amounts were appropriated in the general appropriation bill for each of the fiscal years ending July 31, 1910 and July 31, 1911, and to be expended under direction of the regents of the University.

For support of forestry school, $4,000.

For practical instruction for students of forestry school, $5,000.

For experiments in the use of preservatives of timber, $1,500.

DEMONSTRATION FOREST IN CARLTON COUNTY

The last legislature appropriated $10,000 to be expended by the regents of the University for a demonstration forest in Carlton county, under the following act. In all, the legislature appropriated $31,000 for forestry to be expended by the regents of the University.

AN ACT providing for the acquirement by gift or purchase of certain tracts of land in Carlton County, Minnesota, for a demonstration and experiment forest for the University of Minnesota and providing for its care and maintenance and appropriating money therefor.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. Whereas the honorable Secretary of the Interior of the United States has been duly authorized by act of Congress to convey to the State of Minnesota certain lands situate in the Fond du Lac Indian reservation in the County of Carlton in said State, subject to all then outstanding contracts for the sale of timber thereon, upon receipt by said Secretary of the Interior of the sum of one dollar and twenty-five cents per acre, to him paid by any person or persons on behalf of said State of Minnesota. and

WHEREAS, Congress has removed all restrictions on alienation as to any Indian allottee, or allotment embraced in certain adjoining tracts on said reservation, in order that said allotments might be conveyed to the said State of Minnesota, and

WHEREAS, said lands by reason of their favorable location, the nature of their soil, and the growth of young timber thereon, are specially adapted for a forest practice ground, demonstration forest and experiment station for the students of the forestry department of the University of Minnesota.

WHEREAS, certain citizens of Minnesota are desirous of paying said sums of money to said Secretary of Interior, so that certain said lands may be presented as a free gift to the State of Minnesota, to be used for the purposes for which they are specially adapted, as above recited.

Now, therefore, to the end that said tract may be investigated and accepted by the State of Minnesota, the board of regents of the State University is hereby fully authorized and directed and empowered to examine said tract of land, or to cause the same to be examined in such manner as shall seem to them proper, and if in their judgment said lands shall be found suitable and proper for the purposes hereinbefore recited, and shall be free from private holdings, and subject only to said prior rights to cut certain timber therefrom and shall be in a solid body, and amount to not less than two thousand and two hundred acres, the said board of regents is hereby fully authorized and directed to accept said tract of land for and in behalf and in the name of the State of Minnesota, subject only to said right of cutting certain of said grown timber now thereon, and subject to the further condition that said timber shall be cut at such times and upon such terms and conditions as to said board of regents seems practical and best adapted to promoting the use of said land for forestry pruposes.

SEC. 2. The Attorney General is hereby directed to assist said board of regents in securing said tract of land whenever requested so to do, and to act for the State in obtaining title whenever it may be desirable to do so. He shall also pass upon the title to all land which may come to the State in this way, and see to it that the State has good and indefeasible title therein.

SEC. 3. The Board of Regents of the State University is hereby directed to manage said University forest as a practice ground, demonstration forest and experiment station for the students of he forestry department of the University of Minnesota.

SEC. 4. There is hereby appropriated out of any money in the State Treasury not otherwise appropriated the sum of two thousand five hundred dollars ($2,500.00) for the fiscal year ending July 31st, 1910, and two thousand five hundred dollars ($2,500.00) for the fiscal year ending July 31st, 1911, for the establishment and care and maintenance of said forest experiment station, and in addition the further sum of five thousand dollars ($5,000.00) is hereby appropriated for the purchase of four hundred and eighty (480) acres of Indian allotments located in or adjacent to said land, or so much thereof as may be found desirable, all to be expended by said board of regents for the purpose herein stated, provided that no portion of this appropriation shall be available until the tract of land, amounting to not less than 2, 200 acres, shall have been given to the state free of all costs or charges whatsoever and subject only to the conditions hereinbefore recited.

Approved March 31, 1909.

CONSTITUTIONAL AMENDMENT FOR REFORESTRATION.

In my last annual report I recommended the passage of a bill by the legislature to submit a constitutional amendement providing a tax of three tenths of a mill on each dollar of taxable property to enable the state through the forestry board to purchase forestry land and maintain forests thereon according to forestry principles. The plan received the endorsement of many prominenet citizens. A bill in these terms was introduced in the last legislature but the forestry committee of the House reduced the amount of tax to one-tenth of a mill and it was passed by the House in that amount. The Senate committee on forestry agreed to the same amount, but to secure the passage of the bill in the Senate the amount of the tax had to be reduced to one-fifteenth of a mill and the House agreed to that amount; so that the bill as finally passed calls for a vote by the people at the next general election upon the question whether they will approve of a tax of one-fifteenth of a mill on each dollar of taxable property.

Should the amendment be adopted it becomes imperative on the proper officials to levy the tax without any further legislation. If adopted the system will be in operation without further recourse to the legislature and it will annually raise about $72,000. The full act is printed below. With $72,000 the forestry board could probably purchase annually and plant with principally pine and spruce about 6,000 acres, which would be the property of the State. Succeeding legislatures would probably make appropriations to extend the work; for rightly done it would surely be popular.

New York and Pennsylvania each expend more money annually for reforestation, but there is no State that has yet adopted a constitutional amendment for reforestation. One advantage of the constitutional amendment is that the system will be permanent. The forestry board or whatever other organization shall be entrusted with the work can proceed with better economy because it will be known just how much money can be depended upon in any year.

HOW WE WOULD GO ABOUT REFORESTATION

First, obtain the land. Not in one body but in tracts of suitable size for economical administration. Carefully select and prepare ground for a nursery in which to raise the necessary seedlings or tree plants and which should be of only medium fertility. One acre on an average will contain 200,000 evergreen seedlings. The seedlings would be taken up when two years old and planted about four feet apart, being at the rate of 2,722 seedlings per acre. If we had 1,000 acres of average cut-over land to plant we would find that five per cent of the area was already well stocked (close growing) with valuable kinds of timber trees; that another five per cent of the area consisted of rocks, stumps or wet places making in all ten per cent of area which would not be planted, leaving 900 acres net to be planted. Therefore to plant 1,000 acres with seedlings four feet apart would require 2,449,800 seedlings. As the seedlings require to be at least two years old before planting, the area of nursery should be sufficient to contain twice the number intended to be planted in any one year.

Having obtained the land, we would before frost employ some competent young fellows, in a seed bearing year to climb pine and spruce trees—full grown and healthy trees—and with light poles and proper knives at the end, clip off the cones. By drying the cones in the sun or subjecting them to heat not exceeding about 90° Fahrenheit the seeds can be shaken out. Two bushels of white pine cones will yield fully 30,000 seeds. The seed must be kept in a cool place, generally suspended in bags and protected from vermin till spring. The seed can be sown in rows or broadcast. Great care must be taken to protect the beds from gophers, other vermin and birds; and the plants, from the time they are up out of the ground must for two months at least, be protected from the sun by lath screens or arbor of boughs. After taking up the seedlings for planting the roots should never be exposed to the sun but kept in thin mud. With a boy to carry them in a pail and to carefully hand them out, two men will plant about 2,000 seedlings per day. The planting should be done in the spring and started as soon as the frost is out of the ground. The workmen should use worn and very light spades.

Let it be remembered that this amendment has to be be voted on at the general election, November 1910. It is important that patriotic people and educators of public opinion become thoroughly informed on this matter and see that their communities are likewise informed, so that, if possible, a majority vote for the amendment can be obtained.

Here is a chance to

DO SOMETHING FOR POSTERITY.

We would not have to-day our present school fund of $20,000,000 had not the people over 40 years ago practiced a little self-sacrifice. This tax of one-fifteenth of a mill on each dollar of taxable property will amount to seven cents on each $1,000. Why should a citizen vote for this tax of one-fifteenth of a mill for reforestation? He will not derive much material benefit from it. The principal reason why he should vote for it is because he wants to be a good citizen and make a slight sacrifice that will benefit posterity.

There are few facts that can not be denied and which ought to be remembered in connection with this question. First, Minnesota has a climate and considerable soil well adapted for the production of coniferous (pine and spruce) forests. Our present primeval pine forests will, as a source of a leading industry become exhausted in a few years. Nature alone cannot restore these forests for centuries. Probably not more than five per cent of the cut-over pine lands in Minnesota that would be used for forestry purposes are well re-stocked by nature with valuable kinds of trees. Even in a State like Prussia where scientific forestry has been carried on for centuries and forest fires seldom occur, nature is not relied upon alone to restore forests, but 44,000 acres are there annually replanted or sown.

Reforestation is simply a business proposition. The money used in reforestation will not be an expenditure but it will be a

SAVINGS BANK INVESTMENT;

because it is shown by the experience of every German State in Europe that money expended in forestry gives a net money return to the state of about three per cent compound interest. Then there would be the many indirect benefits of giving steady employment to thousands of working people, lending beauty to scenery, improving climate, maintaining waterflow in streams and affording covert for useful game.

We must remember that forests administered by the State on scientific principles must be provided with roads. If there is agricultural lands in the midst of a forest it will be occupied by farms. In what is called the Black Forest—on account of the dark color of the fir foliage—which occupies a region in Baden and Wurtemburg 90 miles long and about 30 miles in breadth, are a million people in villages and cities. The forests in Germany have such fine roads and the scenery is so attractive that they are health and pleasure resorts of the people.

Forestry is making great progress in this country. Nearly every State is taking it up. In 20 or 30 years it will have made great progress in Minnesota. You who are young will exult in a generation from now when you see the great benefit forestry has wrought in your State if you can look back and feel that you had some part in the good work. Pine planted on good soil would grow to merchantable size in forty years, but nobody wants to plant pine on good soil unless it should be very hilly or rocky. Good soil is more profitably used for field crops. It is expected that reforestation will be practiced only on third and fourth rate land that is unsuitable for agriculture. Such land, we know from the yield tables of Germany, requires about 80 years on an average for pine to grow to merchantable size, say 12 inches diameter breast high. In a normal forest—that is a forest from which crops of timber can be regularly cut—an acre of pine will on third or fourth rate land in 80 years yield 18,000 feet board measure. If we had started a normal forest by planting this last spring 1,000 acres with pine seedlings—from three to five feet apart—next year planting 1,000 and each succeeding year the same, in 80 years from the 1,000 acres we planted this year we could expect to cut 18,000,000 board feet of timber.

INCREASE OF POPULATION.

We must remember that the population of this country since its first settlement has increased at the rate of eighteen per cent every ten years. In 80 years from now the population of the country at the same rate of increase will reach the vast figures of three hundred and twenty million. Anyone can see that the demand for forest products will then be much greater than now.

The adoption of this constitutional amendemnt will give your State high rank before the country. The work can begin with the opening of the Panama Canal.

Minnesota voter! When you take the pencil to check your vote on this amendment think what it will do for your children.

TEXT OF LAW PROPOSING CONSTITUTIONAL AMENDMENT

AN ACT proposing an amendment to article nine of the Constitution of the State of Minnesota, providing a tax for reforestation.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. The following amendment to article nine (9) of the Constitution of the State of Minnesota, is hereby proposed to the legal voters of said State for their approval or their rejection, which amendement when so approved shall be known as section eighteen (18) of said article nine (9) and shall read as follows:

Sec. 18 To secure a sustained yield of timber for the use of the people of this State, the proper officials shall annually levy and collect a tax of one-fifteenth of one mill on each dollar of taxable property within this State, the proceeds of which shall be used for the purchase of land better adapted for forestry purposes than for agriculture for the State at not over $3.00 per acre, and for the production and maintenance thereon of forest according to forestry principles.

Unexpended balances shall not lapse but constitute a fund for forestry purposes.

The timber produced thereon shall be sold at a fair valuation and the revenue therefrom or from other sources shall be paid into the State treasury, except that one-quarter of the net revenue shall be paid to the towns, or if unorganized, to the county, in which the land is situated, in aid of public schools and roads.

Should any tract acquired be found better adapted for any other purpose than the production of timber, it may be sold and the proceeds used for acquiring or developing forestry land.

Until otherwise directed by the legislature, which may supplement these provisions with necessary enactments, the State Forestry Board shall draw and disburse the

money hereby provided and purchase, manage and control the lands and forests.

No money shall be paid for any tract until the Attorney General shall certify to the validity of the title.

It shall be competent for two successive regular Legislatures, by a two-thirds vote of each house, to repeal any of these provisions.

SEC. 2. This proposed amendment shall be submitted to the electors of said state for thier approval or rejection at the next general election for the year 1910, as is now provided by law for submission of amendments of the Constitution of this State, and each of the legal voters of said State may at said election vote by ballot for or against said amendment, and if it shall appear therefrom that a majority of the voters voting at said election upon said amendment "yes" or "no" have voted in favor of the same, then within ten days after the result shall have been ascertained the governor shall make proclamation thereof and said amendment shall thereupon take effect and be in full force as part of the Constitution of the State of Minnesota.

Approved April 20, 1909.

REFORESTATION BY INDIVIDUALS.

The following bill was enacted to encourage timber growing by private owners of land:

AN ACT proposing an amendment to article nine of the Constitution of the State of Minnesota, relating to exemption from taxation of certain lands used for reforestry purposes.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. The following amendment to article nine of the Constitution of the State of Minnesota is hereby proposed to the people of the State of Minnesota, for their approval or rejection, which amendment when adopted, shall be known as section 17a of said article nine, that is to say:

Sec. 17a. Laws may be enacted exempting lands from taxation for the purpose of encouraging and promoting the planting, cultivation and protection of useful forest trees thereon.

SEC. 2. Such proposed amendment shall be submitted to the people for their approval or rejection, at the general election for the year one thousand nine hundred and ten, and the qualified electors of the State, in their respective districts, may, at such election vote for or against such proposed amendment, by ballot, and the returns thereof shall be made and certified within the time, such vote canvassed and the result thereof declared in the manner provided by law with reference to the election of state officers, and if it shall appear thereupon that a majority of all the electors voting at such election shall have voted for and ratified the said amendment, as provided in the next section hereof, then the governor shall make proclamation thereof, and such amendment so ratified shall take effect and be in force as a part of the Constitution.

SEC. 3. The ballots used at said election on said proposed amendment shall have printed thereon: "Amendment of Article Nine of the Constitution relating to exemption of certain lands from taxation to encourage reforestation thereon. Yes——. No——." Each elector voting upon such proposed amendment shall place a cross mark thus "X" in a space to be left on the ballot opposite the words "yes," and "no," according as he may wish to vote for or against said amendment, and his vote shall be counted in accordance with the expressed will of such elector, as provided by the election laws of this State.

SEC. 4. This act shall take effect and be in force from and after its passage.

Approved March 27, 1909.

Should this amendment to the Constitution be adopted, the legislature will have the power to exempt from tax, land on which private owners grow valuable kinds of timber trees. Naturally the State would have to see that the production of timber on such land was conducted in good faith and according to forestry principles.

FORESTRY FOR MINNESOTA

ABRAHAM KNECHTEL,*
INSPECTOR OF FOREST RESERVES FOR THE DOMINION OF CANADA.

INTRODUCTORY.

No country has ever existed without wood. No country will ever exist without it. Wood will be in common use when there is no more iron, and no more coal. Any farmer can grow it, and every farmer would grow it if the price were sufficiently high. It is simply a vegetable crop, and it does not even require a fertile soil. There will be a period of scarcity and the world will suffer great inconvenience; but there will eventually be enough wood to supply every State and every country. How to bridge over that coming period of scarcity is the problem that concerns us now.

WHO SHOULD PROVIDE THE CROP?

A wood crop is a long time in maturing. The average person engaged in raising crops is compelled to raise those that yield him a present profit. He cannot grow a crop to meet a scarcity eighty years hence, no matter what profit it offers. It needs capital to do that. The average man must provide for himself and his family as the days go by, and so he is compelled to raise an annual crop. He may be willing and even anxious to assist in planting, cultivating and harvesting the wood crop; but he cannot wait a long time for his pay. So we must not expect the farmer to raise the timber for the State, though he may, and will, no doubt, use the poorer portions of his farm to raise a small amount for his own convenience.

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*Mr. Knechtel was formerly forester for the State of New York and has contributed this paper at the request of the Forestry Commissioner of Minnesota.

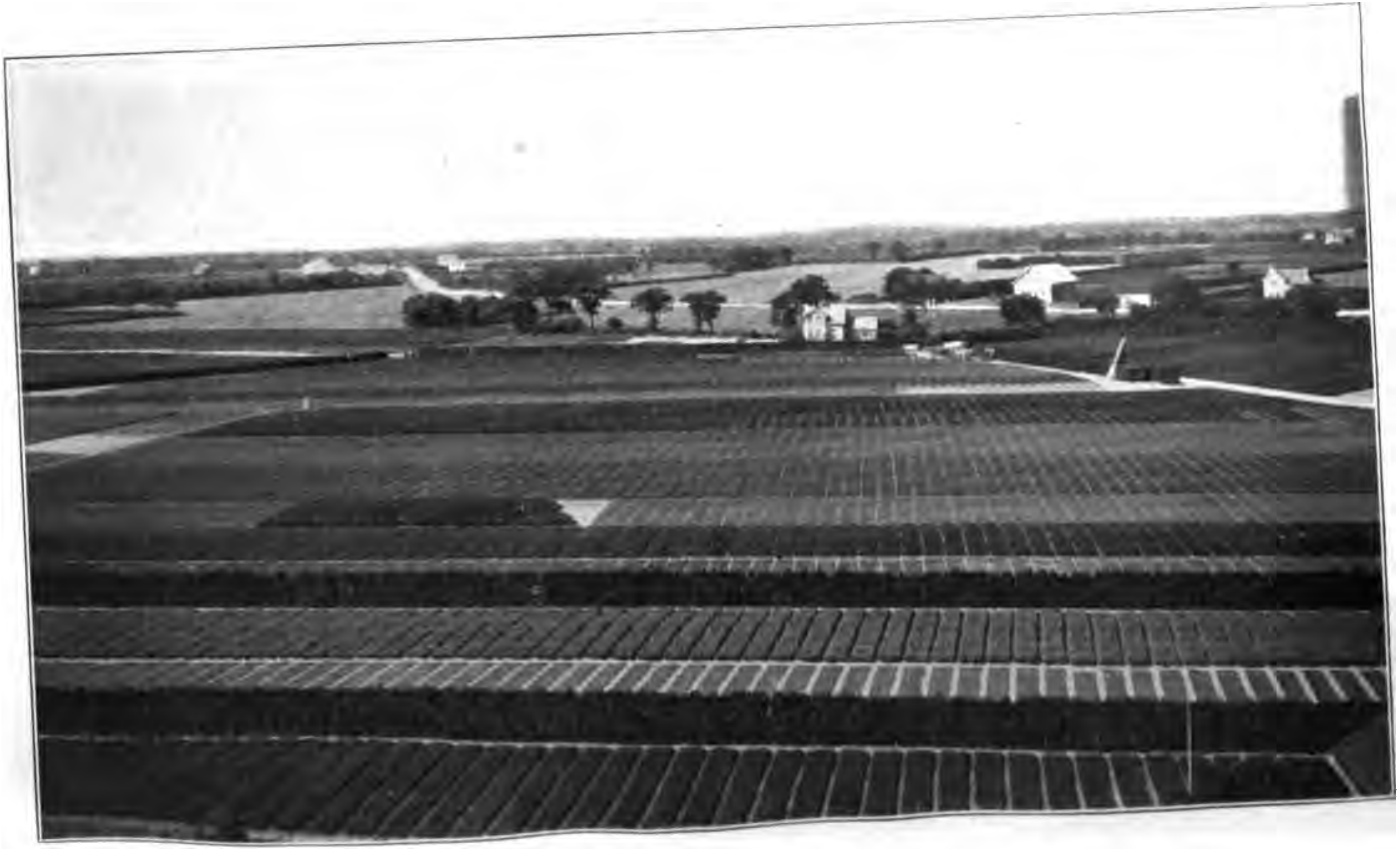
It would be unwise to rely upon corporations to meet the coming scarcity of wood. Corporations expect large profits and may or may not see sufficient chances for gain to induce them to engage in the business of growing wood for sale, though railroad companies and other large concerns may, and probably will, raise wood to suit their own peculiar needs.

The State is the only organization that can properly undertake to raise the timber for the State. The object of the State would be, not to enrich itself, but to provide the necessary wood for the arts and industries, and to provide employment for its citizens at a fair remuneration.

A MISTAKEN NOTION.

There is common a mistaken notion that the present generation growing a wood crop bears the whole expense, while all the profits go to the succeeding generation. Such notion is short sighted. The present generation may furnish the money for the work; but as the work progresses it will receive the money back. Part will go for the purchase of land, and the remainder for labor. It will all flow back again into the various channels of trade. But you ask, where does the gain come in to the present generation? It comes from the utilization of two natural resources that are now going to waste. These natural resources are waste time and waste land. A large percentage of the population are idle, seeking employment. This idle time is now a great loss to the present generation, as the idle people must be supported. Forest culture makes this waste time profitable. It also makes profitable large areas of idle, waste land good for nothing but raising trees.

To be sure the succeeding generation will also profit by the crop. A man plants a tree. Earth, air and water work upon it for eighty years. The next generation has the timber. The natural resources of earth, air and water now going to waste will by forest culture be utilized and make profit for the succeeding generation.



A forest nursery in Germany.

HOW TO DO THE WORK.

Most people admit the necessity for conserving, improving, reproducing, and creating forests; but the problem is vague and the average voter hardly knows how to vote upon forestry questions. He wishes to know how the work is going to be carried on by the State, what money the State will need to furnish, how the money will be employed, and what results may reasonalby be expected. To answer these questions is the object of this paper.

COLLECTING SEED.*

The collection of seed is the first step in planting a forest. The seed of evergreens exists in the cones or "burrs" which hang at the tops of the trees. These are gathered in early fall by means of a platform across two ladders; or if a lumbering job is conveniently located, as the trees are felled the cones are picked from their tops. The cones are put into sacks and taken to a drying house, where they are spread out in a thin layer on wire screens, three meshes to the inch, placed as shelves, under which run hot water pipes from a furnace. The drying room is made with a lean-to roof facing the south, and is principally of glass, so as to make use of the heat of the sun.

In every good cone are many seeds, two above nearly every scale. A bushel of cones will yield about a pound of seed when thoroughly cleaned. But when the cones are gathered the seed is imprisoned, for the scales are firmly closed and sealed with pitch. This is the reason why they need to be spread out on screens and heated. When heated the pitch becomes brittle and the scales loosen and open. For spruce and white pine cones, the heat of the sun through the glass room is sufficient. For harder cones, such as Jack pine or Lodgepole pine the pipes are heated.

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*This description of collecting seed and making a forest nursery was written in part in 1906 for the Forest, Fish and Game Commission of New York. In 1908 it was revised for the Forestry Branch of the Dominion of Canada and printed in a bulletin entitled "Planting and Care of a Forest of Evergreens." It is here again revised.

When the seed is sufficiently loose, it is thrashed out with a flail. It is separated from the empty cones by shoveling it on to a screen stretched over a box, the screen having three meshes to the inch. As the material is moved about with the hand the seed passes through the screen and is caught in a box beneath, the empty cones remaining on top.

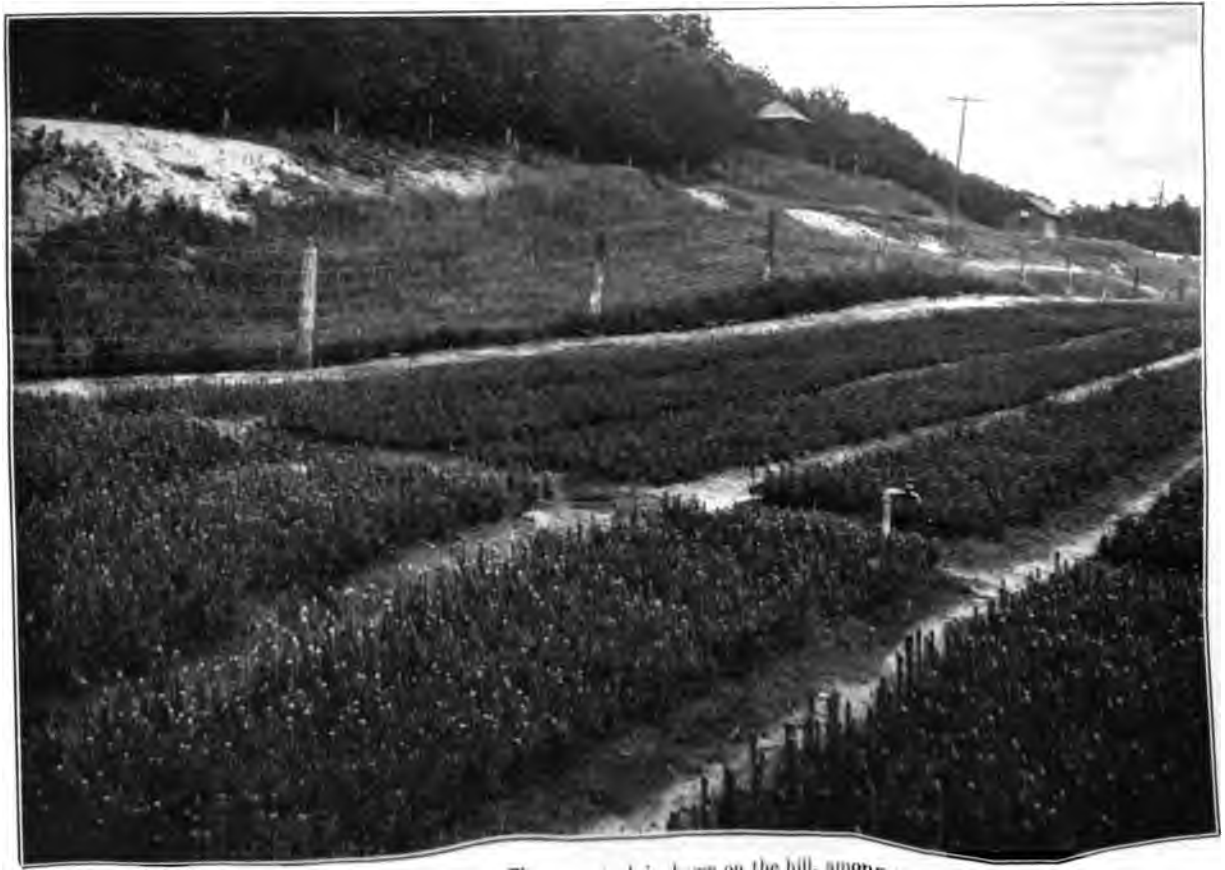
Each seed as it comes from the cone has a wing, by which, when falling from the tree, it is borne by the wind. This is one of nature's methods of dispersing seed and clothing the earth with vegetation. In handling the seed, however, these wings, which in white pine are an inch long, are not needed and are even objectionable. So they are removed by rubbing the seed through a screen which has six meshes to the inch.

The seed is cleaned by putting it through a fanning mill with three screens, the upper one with two meshes to the inch, the middle one with four, and the lower with nine. It is then put away till spring in a cool, dry room free from vermin.

THE NURSERY.

In the spring as soon as the soil is thoroughly thawed out, a piece of ground is prepared pretty much in the same way as for a vegetable garden. Good sandy loam is suitable soil, and upon this is put three inches of well-rotted manure, and a bushel of fresh hardwood ashes for every fifty square yards of surface. The manure and ashes are throughly worked into the soil. This would better be done one year before making the seed beds, so that any weed seeds in the manure may be germinated in advance. A crop of peas may be grown upon the ground during the first year.

Beds are made usually four feet wide and twelve feet long, running east and west, and a box is put around each, made of boards one and one-half inches thick and eight inches wide set on edge. The box is placed so that it projects about five inches above the bed, the upper part being bored full of holes with an inch bit so as to permit a free passage of air over the bed and yet keep out the birds. Preferably the box is made with its lower part a board three or four inches wide, and its upper part



Part of forest nursery, showing hydrant. The water tank is shown on the hill, among the trees. In Germany.

a frame with screen four or five inches wide stretched over it, the screen having a three-quarter inch mesh.

The surface of the bed is made convex and the soil is raked until it is very fine. Sometimes it is put through a sieve. If the weather is dry, it is then watered thoroughly. The seed is sown so that the grains will lie about one-fourth inch apart. This will take for each bed three-fourths of a pound of white pine seed, or half a pound of spruce, Norway pine, or Jack pine. The surface of the soil is then compacted with the back of the spade, and sand is sifted over the bed, just enough to put the seed well out of sight.

Then a wire screen with half inch mesh is put over the bed to keep the birds trom taking the seed, and over this is put a lath screen made by placing the pieces of lath the width of a lath apart to give the bed shade. Extra pieces are also laid loose into the spaces, and the upright wire screens in the box are covered with thick paper so that the bed is thoroughly darkened. As soon as the seed is well germinated, however, the paper and the extra lath are removed, and on cloudy days the lath screen is lifted off entirely, but on bright days during the first summer it is kept on the bed. A good seed bed should have in the fall two hundred good trees on every square foot of surface.

The weeds must be kept out of the seed beds, and in moist climates great care must be given the trees during the first two years least they damp off. "Damping off" as it is called, is a fungus disease which, on close damp days, seems to rot off the little trees near the surface of the soil. On such days the trees must have constant care. Any device which will throw over the beds a constant current of dry air will save them. In absence of such device, charcoal powdered and heated should be sprinkled over the beds every quarter hour.

The beds should be well watered every third day in times of drought, and this should be done in the evening. For this purpose a large nursery should be fitted up with a system of water pipes and hydrants. If the nursery is located near a rapid stream a hydraulic ram can be used to pump water into a tank.

A short time before the snow falls the screens and boxes are removed, and when the beds are covered with about two inches of snow, one thickness of burlap is laid over them. This keeps the trees from being heaved out during the winter. The burlap is removed in the following spring as soon as the danger from heaving is over. The beds of pine should then be top-dressed with finely ground bone meal; but this should not be applied to spruce beds.

The trees remain in the seed beds for two years. During the second summer the beds need only to be weeded and guarded against "damping off ."

In the spring of the third* year, as soon as the ground is thoroughly thawed out, the trees are transplanted into other beds in the nursery. This causes them to throw out many fibrous roots so that later when the tree is set out in the field, its chances for living are very much increased. In transplanting, a spade is thrust under the plants, and they are lifted from the bed. The trees are shaken out very carefully so as not to tear off any of the roots, and they are placed immediately in a pail containing thin mud. In handling the trees great care is taken not to permit the roots to become dry, not even for a second. It is astonishing how quickly the fine rootlets will bcome dry in the sun and wind.

The trees are set in the transplanted beds in rows, four inches apart, the trees placed also four inches apart in the row. A string is stretched along one side of the bed. A board four inches wide, with nicks cut every four inches along one edge, is laid across the bed to space the plants, one end of the board being brought to the string for every row. The soil is dug away from the edge of the board with a trowel, the plants are set opposite the nicks and the trench then filled in. Spruces are left in the nursery until they are four years old; pines can be taken to the field at three years of age. At these ages the trees will be from nine to twelve inches high and will have cost where wages are $1.75 a day, about $2.50 a thousand.

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*The pines may be transplanted in the spring of the second year.

A planted forest.

PLANTING.

The trees are taken up from the nursery with a spade, the roots are puddled and the trees are packed into baskets or boxes lined with wet burlap and are taken to the planting field. When they arrive there, a trench is dug and the trees are taken from the boxes, dipped into water, and set in the trench in a thin row, tops up, the trench filled in, and the soil tramped thoroughly against the roots. They will stand thus " heeled in " for two weeks without suffering.

In setting them in the field, they are spaced five feet apart each way. This may seem close planting, but it is necessary to have the trees soon grow together, so that they will become tall and slender, lose their lower branches, and make timber free of knots. One can easily see the effects of close planting by comparing trees grown in the dense forest with isolated individuals grown in the pasture field. The former have cylindrical trunks, often without branches for a height of eighty or one hundred feet; while the latter have short conical shafts with branches almost to the ground.

In planting, the men work in pairs, one with a grub hoe who makes the holes, the other with a pailful of plants who sets the trees. Two men can plant 1400 trees in a day of eight hours. A force of sixty planters needs two men extra as foremen, two to set stakes over the field so that the men can plant in straight lines, two to carry plants, and one to carry water for the men to drink, and to keep water constantly in the planting pails. A time keeper is also necessary.

To house these men comfortably on the field, there are needed two cooking tents, each 12x14 feet, one provided with a range and cooking utensils; two dining tents 14x20 feet; six sleeping tents 14x20, each one provided with a collapsable stove, six spring mattresses, six straw mattresses and thirty-six good blankets; also a small tent for the foreman and time-keeper, furnished with proper bedding. This tent should have a floor as the time-keeper will spend much of his time in it in keeping his accounts. Good board can be furnished the men for fifty cents a day, including the wages of the cook and his assistant.

After the forest is planted, a few trees, of course, die, and it is necessary for a few years to replace these with live ones from the nursery. With this exception the young planted forest needs but little care.

THINNINGS.

But when the forest reaches the age of about 20 years, it needs to be thinned, as the trees will be crowding each other so hard that each will be hindered in its growth—the struggle for existence will have become intense. More than half the stock is taken out in the first thininng. The trees can be used for Christmas trees. Then about every ten years after this, another thinning must be made. The second thinning may be used for pulpwood, and the third and subsequent ones for pulpwood and lumber. In these thinnings the poorest trees are taken, all the dead, diseased and crooked being removed.

THE FINAL CUT.

The trees left for the final cut will remain until they are eighty years of age. There should then stand on an acre from 160 to 200 straight, cylindrical trees, 12 to 15 inches in diameter and about 80 feet high with shafts free from branches. These will then be removed and the forest planted again.

COST OF OPERATING EQUIPMENT.

The cost of operating equipment will, of course, depend upon the magnitude of the planting operation. We shall be safe, however, in figuring out the cost on the following basis; That one seed house will be sufficient; that four acres will make a convenient nursery, and that seventy-two men will be an economical planting crew. The items of cost for these will be about as follows:

The seed house.

SEED COLLECTING OUTFIT.

Seed house, complete	$ 950.00
Ladders, pails, sacks, etc	50.00
Total	$1000.00

OUTFIT FOR ONE NURSERY.

Preparation of soil and fertilization	$150.00
Wire and posts for fencing	100.00
Lumber for frames	50.00
Wire screens	100.00
Tool house with office	250.00
Tools	50.00
Watering plant	800.00
Total	$1500.00

PLANTING OUTFIT FOR ONE CREW.

2	Cooking tents, each	12x14x3′	$ 35.00
2	Dining tents, "	14x20x3′	55.00
6	Sleeping tents, "	14x20x3′	165.00
1	Tent for foreman "	10x12x3′	14.50
1	Cooking range		35.00
6	Collapsable heaters		12.50
36	Spring mattresses		98.00
36	Bed ticks		25.00
200	Pairs blankets		390.00
	Cooking utensils, dishes, etc		162.00
	Grub-hoes and pails		10.00
	Total		$1,002.00

OPERATING COST.

The following table shows how a forest planting operation might proceed upon an annual expenditure of $72,000.

It shows for each year how the money might be apportioned. It provides for all initial expenses and for keeping all the equipment in repair. It allows the work to continue without any extra money for fifty-eight years. It provides for protection against fire but assumes that after fifty-eight years the thinnings will take care of the increase in the cost of fire protection, and the purchase of land. By this scheme there will be planted in eighty years 347,800 acres. The forest should then not only be self supporting but should be yielding to the State an annual revenue, dependent upon the price of timber at that time. No allowance has been made for taxes since in Minnesota there is no tax on State property.

TABLE OF ANNUAL EXPENSE OF REFORESTING THE STATE OF MINNESOTA WITH AN ANNUAL OUTLAY OF $72,000

YEAR	Outfit for Collecting and Extracting Seed	Collecting and Extracting Seed	Number of Nurseries	Nursery Outfit	Work in Nurseries	Output of Nursery Stock. No of Transplants	Planting Outfit	Planting	Filling Blanks	Acres Planted	Fire Protection	Acres Purchased	Cost of Land	Timber 80 years after Planting. Board Feet
1913	$1,000	$50	1	$1, 500	$1,000	....	....	....	....	....	....	22,817	$68,450	....
1914	100	100	3	3,100	3,000	....	....	....	....	....	....	21,900	65,700	....
1915	100	150	8	7,800	8,000	....	....	....	....	....	....	18,650	55,950	....
1916	100	175	12	6,800	12,000	400,000	$1,000	$1,400	....	235	$15	16,837	50,510	4,230,000
1917	100	200	16	7,200	16,000	1,200,000	1,100	4,200	....	705	60	14,380	43,140	12,690,00
1918	100	225	20	7,600	20,000	3,200, 000	1,200	11,200	$280	1,880	180	10,405	31,215	33,840,000
1919	100	225	20	2,000	20,000	4,800, 000	1,300	16,800	840	2,820	360	10,125	30,375	50,760,000
1920	100	225	20	2,000	20,000	6,400,000	1,400	22,400	2,240	3,760	600	7,678	23,035	67,680,000
1921	100	225	20	2,000	20,000	8,000,000	1,500	28,000	3,360	4,700	900	5,305	15,915	84,600,000
1922	100	225	20	2,000	20,000	8,000,000	600	28,000	4,480	4,700	1,200	5,132	15,395	84,600,000
1923	100	225	20	2,000	20,000	8,000,000	600	28,000	5,600	4,700	1,500	4,658	13,975	84,600,000
1924	100	225	20	2,000	20,000	8,000,000	600	28,000	5,600	4,700	1,800	4,558	13,675	84,600,000

NOTE.—The planting of the year 1924 is intended to be continued forever.

EXPLANATORY.

On examining the Table of Annual Expense, it will be observed that the nursery work, as there indicated, begins with only one nursery, but increases each year until 20 nurseries are in operation. When the plants in the first nursery are three years old the planting begins with 235 acres and increases until 4,700 acres are planted annually. "Make haste slowly" is a good motto to follow in any new undertaking. Economy and success are dependent largely on experience. There are likely to be some initial mistakes and if the operation is a large one, these are likely to be costly. If, however, the State begins the reforesting as indicated by the Table, losses incident to the newness of the work will be small, while the experience gained will be as good as if the work were begun on a larger scale.

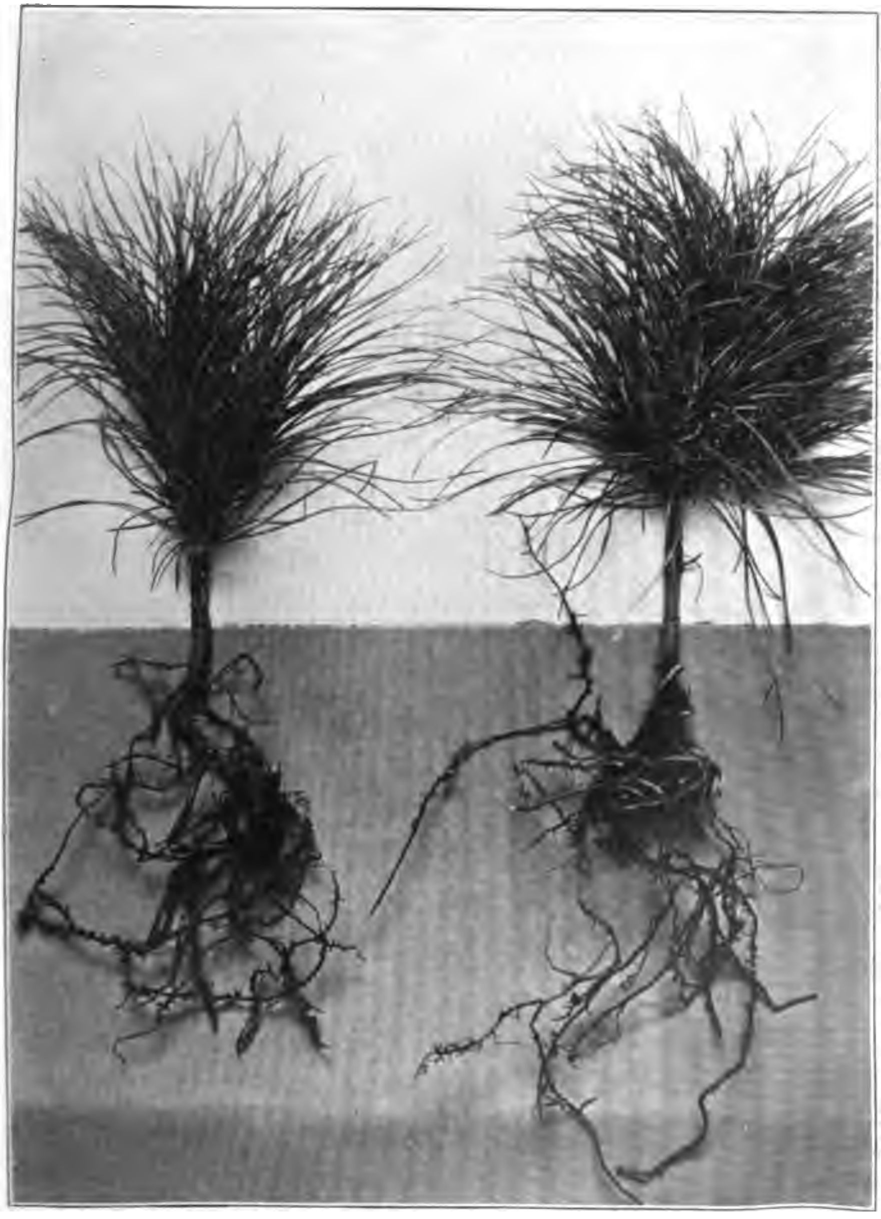
While the State is thus gaining experience the purchase of land, as indicated, goes forward as rapidly as the money left over from nursery work, planting, and fire protection will allow. The land will thus, be early withdrawn from further settlement and will likely be obtained at a low figure. It has been the experience of other States purchasing land for forestry purposes, that the price gradually increases as the years go by. The Table, therefore, begins with the purchase of 22,817 acres. With the increase in nursery work, planting, and the cost of fire protection there is a consequent decrease in the money left over for the purchase of land.

With the year 1923 the cost of nursery work and planting becomes stationary and the State could after that date purchase annually 4,658 acres were it not for the increase in the cost of fire protection. This increases $300.00 per annum for 80 years. Hence, the money for land must decrease $300.00 each year. At this rate in the year 1972 there would be no money left for land. But the sale of wood from thinnings will after that date provide for the purchase of land and also for the increase in the cost of fire protection.

DEDUCTIONS.

In Saxony an acre of third or fourth rate land well stocked with trees gives in 80 years an average yield of 18,000 feet board measure. The State should therefore, by the plan here outlined, in 80 years after planting, cut annually from 4,700 acres, 84,600,000 feet of timber. The cost of raising this timber will be about as follows·

Seed collecting outfit	$ 100.00
Collecting and extracting seed	225.00
Nursery outfit	2,000.00
Work in nurseries	20,000.0
Planting outfit	600.00
Planting	28,000.00
Filling blanks	5,600.00
Total	$56,525.00



White pine seedlings, two years old; half natural size.

Amount of $56,525.00 in 80 years @ 3% compound interest		$601,426.00
Cost of 4,700 acres at $3 per acre	$14,100.00	
Compound interest on $14,100.00 for 80 years at 3%		135,924.00
Annuity for fire protection	$300.00	
Amount of annuity of $300.00 in 80 years at 3% compound interest		96,400.00
Total		$833,750.00

Therefore, if it costs $833, 750.00 to produce 84,600,000 feet of timber, it will cost $9.85 to produce 1,000 feet. At this rate, to yield three per cent compound interest on the investment, timber will, in 80 years after planting, need to sell for $9.85 on the stump.

AS A ONE-ACRE PROBLEM.

Cost of one acre of land	$3.00	
Compound interest on $3.00 for 80 years at 3%		$28.92
Raising 1,700 plants and sending them to the field	4.75	
Planting 1,700 trees on one acre	6.08	
Filling blanks with 170 trees	1.20	
Total	$12.03	

Amount of $12.03 in 80 years at 3% compound interest	$128.00
Annuity for fire protection 6⅓ cents.	
Amount of annuity of 6⅓ cents for 80 years at 3% compound interest	20.35
Total cost	$177.27
The yield of one acre in 80 years is 18,000 feet board measure.	
Therefore to give 3% compound interest, 18,000 feet must sell in 80 years for	$177.27
Then 1,000 feet must sell in 80 years for	$9.85

AGRICULTURAL LAND IN NATIONAL FORESTS

By the Act of Congress of June 11, 1906, the Secretary of Agriculture may ascertain the location and extent of lands within forest reserves that are chiefly valuable for agriculture and file lists of the same with the Secretary of the Interior, who shall declare such lands open to homestead settlement.

The Act of Congress of May 23, 1908, requires that twenty-five per cent of all money received from each national forest in any fiscal year shall be paid to the State in which the forest is situated for public schools and roads in the county in which the forest is situated.

These two important provisions of law should do away with any objections heretofore raised against the creation of national forests. If Congress had even 40 years ago established the present system of national forests the benefit to the whole country would have been great.

SUPERIOR NATIONAL FOREST

The first movement for the creation of the Superior National Forest* which was proclaimed by President Roosevelt, February 13th, 1909, was the recommendation of the present Forestry Commissioner of Minnesota to the Commissioner of the U. S. General Land Office in a letter dated May 10th, 1902, and printed in the Chief Fire Warden's Annual Report for 1902, and here reproduced, namely:

St. Paul, Minn., May 10, 1902.

Hon. Binger Hermann, Commissioner General Land Office
Washington, D. C.

Dear Sir: I have the honor hereby to recommend that the following townships, all public land situated in Cook and Lake

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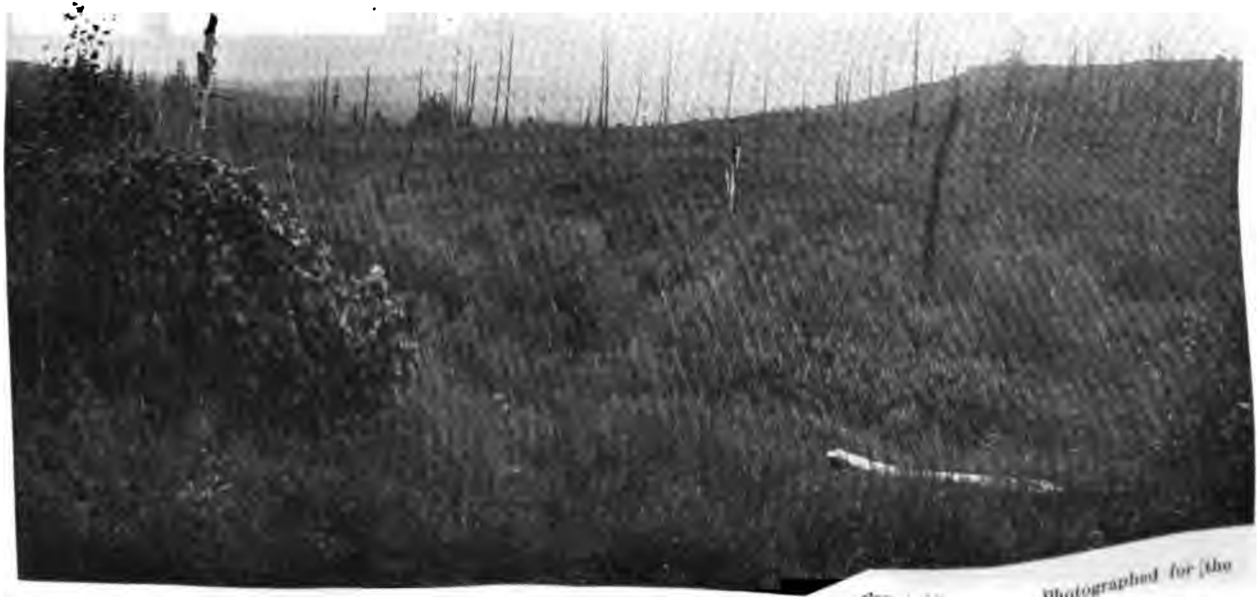
*The first suggestion of a park or public forest at Cass Lake and which finally led to the establishment of the Minnesota National Forest at Cass Lake was made by Gen. Andrews, present Forestry Commissioner of Minnesota, August 1898. Over a million acres have thus been created national forests in Minnesota through his initiative.



From Brule Mountain, looking north, in central part of Cook County, in Superior National Forest, Minnesota. Photographed for the Annual Report of the Forestry Commissioner of Minnesota.

counties, in Minnesota, and compirsing (after deducting water surface) an area in round numbers of five hundred thousand acres, be set apart by the President as a forest reserve, namely:

Township 59, ranges 5, 8, and 9 west.

Township 60, ranges 4 to 9 west.

Township 61, ranges 5 to 11 west, both inclusive.

Township 62, ranges 5 to 10 west, both inclusive.

Township 63, ranges 5 to 7 west, both inclusive, and south half of township 63, range 8.

Ten of these townships are surveyed and all of the lands are practically vacant, with these exceptions: that only half of township 59, range 9 west, and township 60, range 8 west, are vacant, and that two-thirds of township 60, range 9 west, and township 61, range 5 west, are vacant.

I inclose a map of these lands, with notes showing their character, compiled from the field notes in the United States Surveyor General's office of this State.

I make this recommendation for the following reasons:

1. The land has a general elevation of about 1,200 feet above Lake Superior, is generally hilly and rocky and more valuable for the production of timber than for agriculture. It is natural timberland, but much of the original timber was killed by fires many years ago. Its soil is only third or fourth rate, and the fact that although fairly accessible, none of it has been taken by settlers, is of itself evidence that it is undesirable for agricultural purposes.

2. The benefit that will accrue to Minnesota by having this waste and vacant land utilized for forestry purposes. Everyone knows that the supply of pine timber in Minnesota is fast diminishing. Already several kinds of lumber from the Pacific coast are competing here with our home products; and, as our home supply decreases, the price of lumber from the coast will be advanced. Dearness of lumber will tend to retard the development of agricultural lands, farmers being among the principal consumers of lumber. On this land proposed to be created a forest reserve, it will require about eighty years for pine timber to grow to merchantable size The population of the United States in eighty years from now, according to the estimate of the most competent judges, based on our past history, will be 320,000,000. Everyone can see that the demand for lumber will then be very much greater than at present.

3. The land in question contains many fine lakes and streams, and will, if administered as a forest reserve, prove valuable also as a fish and game preserve.

4. The educational effect of such a reserve would be useful in promoting forest economy in this State.

5. I have been reflecting upon this matter for over a year. I have also seen occasional expressions in the public press favoring a forest reserve to include some of the highlands north of Lake Superior. I have examined the Government plats of all the surveyed lands in Minnesota north of Lake Superior, and those herein contained are about the only lands that are available from being vacant. This is the only opportunity (outside of Indian reservations) of securing a number of townships in a body in this State for a forest reserve. Of course it is understood that the State of Minnesota is entitled to sections 16 and 36 in each township as school lands; also that the State will have a right to any swamp lands there may be in either township. Also, should any of the reserve be found to be good agricultural land, I, for one, would expect that the law would be made to permit, if it does not now permit, the use of such lands for agricultural purposes.

I do not expect the reserve to be a wilderness, nor to shut out any necessary means of communication.

Very truly yours,

C. C. ANDREWS.
Chief (Forest) Fire Warden.

THE COMMISSIONER'S REPLY.

Under the date of June 30, 1902, the Commissioner of the General Land Office made the following favorable reply:

DEPARTMENT OF THE INTERIOR, General Land Office,
Washington, D. C., June 30, 1902

PROPOSED LAKE SUPERIOR FOREST RESERVE, MINNESOTA.

MR. C. C. ANDREWS, Chief Fire Warden, St. Paul, Minnesota.

SIR: Referring to your letter of May 10, 1902, recommending the establishment of a forest reserve, to include certain lands in Lake and Cook counties, Minnesota, I have to advise you that the matter has been favorably reported to the Honorable Secretary of the Interior by me, and also by the Director of the United States Geological Survey, and the Honorable Secretary has directed me to make temporary withdrawal of lands substantially in accordance with your recommendation.

On account of the extensive adverse holdings thereon, certain portions of the lands mentioned by you may not well be included within the reserve.

Very respectfully.

BINGER HERMANN,
Commmissioner.

Superior National Forest Minnesota.

SUPERIOR NATIONAL FOREST
MINNESOTA

By the President of the United States of Americ

A Proclamation

WHEREAS, the public lands in the State of Minnesota which are hereinafter indicated, are in part covered wit timber, and it appears that the public good would b promoted by utilizing said lands as a National Forest;

Now, therefore, I, Theodore Roosevelt, President of the United States of America, by virtue of the power in me vested by section twenty-four of the Act of Congress, approved March third, eighteen hundred and ninety-one, entitled, "An Act to repea timber-culture laws, and for other purposes," do proclaim tha there are hereby reserved from settlement or entry and set apar as a public reservation, for the use and benefit of the people, all the tracts of land, in the State of Minnesota, shown as the Superior National Forest on the diagram forming a part hereof.

The withdrawal made by this proclamation shall, as to all lands which are at this date legally appropriated under the public land laws or reserved for any public purpose, be subject to, and shall not interfere with or defeat legal rights under such appropriation, nor prevent the use for such public purpose of lands so reserved, so long as such appropriation is legally maintained, or such reservation remains in force.

In witness whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done in the City of Washington this 13th day of February, in the year of our Lord one thousand nine hundred and [seal.] nine, and of the Independence of the United States the one hundred and thirty-third.

THEODORE ROOSEVELT.

By the President:
Robert Bacon,
Secretary of State.

FORESTRY IN BULGARIA.

Bulgaria, bordering the west coast of the Black Sea and the south bank of the Danube, was in antiquity a part of Thrace. That, in the drama of "The Gladiator," was the native land of Spartacus. Now a slave and gladiator, he had, he says, in boyhood looked from the "cloud-piercing Hoemus" upon a fertile country sloping to the mighty Danube, where "peace was tinkling on the shepherd's bell and singing with the reapers."

Bulgaria, with a population now of over four million, was for five centuries a province of Turkey, but gained its political independence thirty years ago. It has made rapid progress in recent years, and naturally forestry is one of the things that has received favorable attention from its enlightened government.

The total area of the forest in Bulgaria comprises 7,512,000 acres, being 30 per cent of the whole area of the country. Of these, 2,231,000 acres belong to the State, 3,866,000 acres to parishes, 132,000 acres to schools and 1,283,500 acres to private individuals. Scotch pine and other conifers, including fir (*picea pectinata*) and spruce, are the prevailing kinds of trees.

ADMINISTRATION.

The administration of the forests is by a bureau in the Ministry of Commerce and Agriculture, and consists of a chief, an inspector general of forests and two assistant chiefs. The budget for forests and forestry for the year 1905 was $150,000. There are six district inspectors, who have received scientific forestry training, 40 foresters who have received forestry training. There is a district inspector for each 1,250,000 acres and a forester for every 190,000 acres. There is a keeper to patrol the forest to every 3,500 acres. There are also many other employes. For the parish forests there is a forester for every 125,000 acres.

These facts are taken from an unusually able and fine volume entitled "Bulgaria of To-day," issued in 1907 by the Bulgarian Ministry of Commerce and Agriculture, and a copy of which was kindly sent to the Commissioner of Forestry of Minnesota by the British Diplomatic Agent and Consul General at Sofia, Sir G. W. Buchanan. The following are the concluding words of the chapter on forests in said volume:

"The improvement of our forests demands enormous sacrifices, but on the other hand a time will come when the revenue from the forests will play an important part in the State budget. The Bulgarian Government, fully aware of its duties and its interests, concentrates its efforts to this end; to make our forests, by the simplest means, in the near future a source of riches, which are so sorely needed by the young State for the completion of its organization."

It is an interesting fact that Bulgaria, in territorial extent, is only half as large as Minnesota.

Forestry In Other European Countries.

Of the sketches of forestry in sixteen European states which have appeared in my recent annual reports those of eleven countries—Alsace-Lorraine, Baden, France, Hesse, Italy, Norway, Prussia, Saxony, Sax-Meiningen, Switzerland and Wurtemberg, as printed in this report have been wholly revised or contain additional information kindly furnished by their respective forestry directors.

ALSACE-LORRAINE.

STATE FORESTS.

Aggregate extent 343,545 acres, also the state possesses together with several towns and villages 40,630 acres of undivided forests, situated in the valleys of the Rhine and Mosel rivers and on the Vosges Mountains. The prevailing kinds of trees are beech, oak, pine (*pinus sylvestris*), fir (*abies pectinata*) and spruce (*picea excelsa*). The average estimated value per acre is about $100. Annual aggregate expense $1,480,000; annual aggregate revenue, $2,333,000; average net profit per acre, $2.40. The number of acres annually sown with seeds, 1,025; planted with seedlings, 2,915 acres. On 265 acres the surface of the ground is roughly opened with spade, plow, harrow or hoe with a view to facilitate the germination of self-sown seeds. On about 50 per cent of the entire area, reforesting is effected by self sown seed from standing trees; on about 35 per cent of the entire area planting trees; and on about 15 per cent planting seeds is resorted to.

There is a continuity of forest produce. The annual yield or cutting of the forest is not allowed to exceed the annual production. A decrease of the growing stock, by over-cutting the forest, would be considered a criminal offense on the side of the forest administration. The general increase of the productiveness of the forest, however, permits of a gradually, but slightly, increased annual output. The forests consist of more or less averaged sections termed "compartments." Every compartment yields periodically (say in the 40th, 50th, 60th, 70th, 80th and 90th year of tree life) a certain "intermediate yield," composed of immature trees, removed by way of thinnings. When the remaining trees reach financial maturity, they are removed either by a clean sweep or gradually, the removal proceeding hand in hand with the development of the second growth started underneath the mature trees (fir and beeeh).

The cutting of forests, with a view of using the soil for agriculture or pasture thereafter, is strictly prohibited since 1803, unless, under certain stated conditions, permission to the contrary effect is granted by the civil government. Any forest ground cleared from tree growth must be planted up within three years after such clearing, if in the opinion of the forest administration regeneration from self-sown seeds connot be depended upon. The owner of unproductive lands, when proposing to plant such lands to forest, receives certain contributions out of the treasury of the state. Plantations made on the tops and on the steep slopes of mountains, also plantations made on dunes and on unproductive prairies densely clothed with ligneous weeds, are free from taxes for 30 years. The amount of damage annually caused by forest fires is very little; no data available. The principal cause of such fires, when they do occur, is the careless use of matches and cigars thrown away burning. Very few such fires are annually caused by railroad locomotives; no data available. It may be estimated that in Alsace-Lorraine, as in Prussia, 10 per cent of all forest fires are caused by sparks from locomotives.

The forest service is entirely co-ordinate and equal to the other branches of the public service. The average salary per annum of the "Land Forst Meister" (forest councillor) is $2,200; of the "Oberforstmeister" $1,800 of the Forstrat $1,500 the "Oberforster" (district manager) $830; and the allowance for office and traveling expenses of each officer is $500. 27 "Oberfoerster" have the use of unfurnished house, 37 an equal compensation.

PRIVATE FORESTS.

The aggregate extent of private forests is 766,635 acres, of which 544,670 acres are managed on forestry principles, being owned by towns, villages or public institutions. The forests owned by private individuals proper, aggregating 221,965 acres, are managed at the will of the owner except as above stated. The average value per acre is uncertain; it depends on growing stock, accessibility, quality of soil, etc. However the average value of the private forests may be roughly estimated at $275 per acre, The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one-half a cord of fuel. The population of Alsace-Lorraine is 1,641,000. The area of the entire territory is 3,628,000 acres of which 1,110,180 acres are under forest. The annual yield of raw material is 61.1½ cubic feet per acre. Of this amount 45 per cent consists of timber, and 55 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cutting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to 1.5 cents per cubic foot. At this price the workmen earn 52 cents per day. The value of timber, without bark, dragged to forest roads, is 11 cents per cubic foot, on an average. The value of fuel, piled up along roads, is 5.4 cents per cubic foot, or about $3.42 per cord. (The stumpage of timber is worth about $12 per 1,000 feet, board measure.) In the state forests about $100,000 are spent annually for road improvment and forest railroads. In the private forests the exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. Likewise in about half of the state forests the "Oberfoerster" manages the right of hunting by order of the government. In the state forests these leases yield annually 10 cents per acre. In the season of 1903, for instance, there were killed, in the administered districts of the state forests aggregating 188,440 acres, 242 head of red deer, 679 head of roe deer, 298 head of wild boar, 1890 hares and 10 capercailzies, tetrao urogallus (mountain cock), besides a number of minor animals.

A forester of scientific education (Oberforster) has, on an average, under his charge 13,933 acres of forests, managed on forestry principles and being owned by the state, by towns, villages or public institutions.

In the state forests there are steadily employed for every 1,000 acres of forest, 35 experienced forest laborers. Their pay is generally and on an average not higher than that of ordinary laborers 50–55 cents per day.

With respect to the proportion which exists in coniferous forest between reforestation by natural seeding and reforestation by planting, positive data cannot be furnished, except that reforestation of the fir (*abies pectinata*) is principally natural seeding.

AUSTRIA.

STATE FORESTS.

The entire forest area of Austria is, in round numbers, 24,000,000 acres, of which the state administers 2,573,940 acres of actual forest, and of which 800,000 acres belong to religious, educational or charitable endowments. Under the Department of Forestry there are eight territorial offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58,993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.

Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.

Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the larch, occupying 5 per cent. A small area only is in possession

of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hardwoods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter decreasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However, spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata*) is mostly found mingled with beech, horn-beam and spruce. It does not run as high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europœa*) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris*) is found in the Alps and

in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.7 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia, Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca*) is very scarce on the whole. On the south slopes of the Vienna mountains it forms small forests. It is fond of the sunny side and of calcareous ground.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to $8.91. It is likely to range between $3.50 and $20 per acre, according to the possible yield.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, sylviculture, etc.	$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings..............	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc....................................	87,193.67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc..........................	418,499.05
V. For public expenses (taxes and charity expenses).	259,867.44
VI. Money refunded..........................	756.13

VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of boundary lines, forest working plans, prescriptive rights, etc.)	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the ministry of agriculture)	151,340.20
Grand total expense	$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.)	$1,727,805.73
II. From agriculture (rentals from land leased, etc.)	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.)	291,747.02
IV. Money refunded	6,524.15
V. Extraordinary revenue	19,492.24
Total receipts	$2,207,161.30
To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at	290,336.40
Therefore grand total gross receipts	$2,497,497.70
Deducting from this amount the expenses previously mentioned, there remains a net revenue of	$693,741.81

Thus the entire state and fund forests of the Austrian empire have netted on an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of $28,586.01 for labor only. To these planting ex-

penses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper	$17,894.78
II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years	6,406.72
IV. Spades, picks, mattocks and other tools	834.02

Adding these items to the above named figure of $28,586.01, the grand total expense for replanting amounts to $55,416.49, or to $3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these, 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural

regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under the state forest management is pretty constant, whilst it is more or less subject to changes in the different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina being extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the logs than the inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two or three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission,

no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to $1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the time thus prescribed a second punishment shall take place." Paragraph 3: "Areas cleared from forests are to be planted up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to $3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 acres, and causing a loss of $163,904. On the yearly average, 601 forest fires have run over an area of 3,862 acres, involving $32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, while the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests, drawing a salary of $364 to $405 per annum, to which there must be added an additional pay varying from $64 to $162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration, drawing a salary of $445 to $526, with an additional pay varying from $81 to $202; eighth rank, a forest master, or inspecting officer, draws a salary of $567 up to $729 and an ad-

dition from $97 to $243; seventh rank, a forest counselor draws a salary of from $810 to $972 and an additional pay of from $142 to $283; sixth rank, a superior forest counselor draws a salary of from $1,134 to $1,458, in addition to a pay of from $162 to $324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government buildings, paying a rent equal to one-half of the additional pay above mentioned.

PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres (out of which 862,236 were unproductive area), there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land

has been sold actually at prices ranging between $5 and $340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit, after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the diminished area is partly explained by mistakes made formerly in the survey of the forests.

DUCHY OF BADEN.

STATE FORESTS.

The aggregate extent of the state forests of Baden is 248,000 acres, located in the Black Forest, the upper val-

ley of the Rhine and in the Odenwald. The prevailing kind of trees is the spruce. Reforesting is effected by seed from standing trees; also by planting trees; in some rare cases by artificial sowing, the latter in the case of Scotch pine. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the forest law of Baden of the year 1833, no part of any forest is allowed to be kept uncultivated.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Forests and Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councillors of the Forest Board, and have a salary not exceeding $1,380, and $147 for expenses.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

PRIVATE FORESTS.

About one-third of all private forests is managed on forestry principles. The total forest product of the country increases gradually.

BAVARIA.

STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its state forests comprise 2,150,000 acres, and are mostly managed as "selection" forests. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers, red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is $50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to $4,965,204. The total revenue from the forests the same year amounted to $8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforesting is mainly done in the natural way. In the case of the fir (*pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly

What forestry science does. This is a German forest of spruce, planted and managed according to forestry science; trees about 80 and 100 years old. Observe how closely the trees stand. Where forestry is applied, all the land devoted to forest becomes as well stocked with trees.

Examining forestry land north of Vermillion Lake, Minnesota. Photographed, 1904, for the Annual Report of the Forestry Commissioner of Minnesota.

crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforesting is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only $974, in 1894 only $1,686. The principal cause of such fires is the carelessness of the workingmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councilor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would, of course, also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

DENMARK.

STATE FORESTS.

The experience of a country which had adopted important forestry regulations almost at the very beginning of the last century and which has successfully, through tree planting, resisted the invasion of desolating sand drifts from the sea shore must prove of much value. It was, therefore, with a high degree of satisfaction that I lately received from the Department of Agriculture of

Denmark, answers kindly furnished in the English language to some questions that I had submitted. I have put the information in its present form.

The aggregate extent of the state forests of Denmark is 142,140 acres, besides 2,962 acres for public parks. Of these, 67,700 acres are old forests, 74,440 acres are new plantations, especially on heathy tracts. The planting of forests had already commenced one hundred years ago, but has quite particularly increased since 1850. Forty-five per cent of the state forests are situated on the Danish islands; 54 per cent on the peninsula of Jutland, of which latter only 10.6 per cent are old forests, the rest are new heath plantations not yet thoroughly planted up. Beech comprises 37.7 per cent, oak 3.3, ash, maple, birch, elm and alder 4.8 per cent, and conifers 54.2 per cent. Conifers did not exist in Denmark 150 years ago, so that the extensive area of conifers in the state forests at present has been produced artificially. For the planting up of heaths the mountain pine (*pinus montana*) and the spruce (*picea excelsa*) are particularly utilized. The annual aggregate expense of administration averaged $40,000 per year for the period 1893–97. Annual aggregate revenue averaged per year for the period 1893–97: revenue $258,416, expenses $195,370. The smallness of the net revenue arises partly from the fact that about half of the state forests are still so young as to yield only a small revenue, partly from extensive new areas being cultivated every year. The area annually sown or planted to forest averaged 2,285 acres per year for the period 1897–1900. Regeneration from self-sown seed is only used in the case of the beech (*fagus silvatica*) and of the silver fir (*abies pectinata*). In all other cases, forests are regenerated by means of planting plants or sowing seeds.

There is a sustained yield. Every tenth year a working plan is prepared for cuttings and cultivations of the next decennium. In working out these plans it is taken into consideration, as far as may be, that there should be such areas and stocks of wood in store for the future as are available for the decennium. Within such a decennial period the yield of the cuttings varies according to circumstances; as a rule, however, there is but little differing one from the other. The extent of the state forests being on the increase, the proceeds will naturally increase. The forests are divided into parts of 10—100 acres in size, according to the nature of the soil or the species and age of the stock of wood. Within each decennial period a certain number of such divisions are destined for cutting, and the latter is commonly to be finished and the areas restocked with plants at the end of the period.

Private persons are prohibited by the law of September 27, 1805, from cutting away those remnants of the old forests of the country still existing in the said year. In cases of offence, means are placed in the hands of the government to force the owners to restock the cleared area under control of the state officer in charge. Consequently but very few forest areas have disappeared in the course of the nineteenth century. The many new plantations in Jutland which have risen by means of government subventions disbursed through the "Hedeselskabet," are subject to the same prohibition of clearing. Finally, under the guidance of a board of administration not appertaining to the state forestry service, the government has caused the waste sandy downs on the west coast of Jutland to be planted in order to subdue the sand drift in those parts, which had in former times caused great devastation. At the close of 1899 about 27,000 acres of sand downs had been planted with a good result. Damages by forest fires occur every year, but they have hitherto been rather insignificant. On account of the dense population of the country the casual forest fires are quickly quenched. The principal cause of such fires is carelessness of various kinds. It is notorious that several forest fires have been caused by sparks from locomotives, but no number can be stated.

The administration of the state forests is under the Department of Agriculture; its yearly budget is voted under the general budget of finances and its officers are appointed by the king. The state forestry is managed by three forest masters, twenty-three superior foresters, sixty-nine foresters and 306 keepers. The superior foresters have the use of a house free of charge, together with a lot of arable land (30–100 acres) upon which they pay the ordinary taxes, besides a salary of $950–$1,250. The salary of the forest masters is $1,450, to which is added an allowance for traveling and other lawful expenses. The three forest masters give in an annual report on the operations of the local ranges under their supervision. Three reports are prepared in the department and printed in a condensed form as a supplement to the public accounts. Every tenth year is issued a review of the state forestry in the past decennium. The "Tidskrift Skovvasen" (forestry periodical), published in Copenhagen by Mr. C. V. Prytz, professor of forestry in the Royal Agricultural and Forestry Academy, and "Hedeselskabets Tidskrift" (periodical of the society for the cultivation of heaths), published by "Det danske Hedeselskab" at Aarhus, are the periodicals. The revision of the decennial working plans for state forestry, which is simultaneous with the preparation of the working plan for the next ten years, is undertaken by a "Skovtaxator" (appraiser of forests), classed directly under the department, and four assistant clerks. A second "Skovtaxator" with one clerk is constantly occupied in the experimental line, in examinations of the growth of trees and the economy of divers modes of forest husbanding, altogether in support of practical forestry.

PRIVATE FORESTS.

The aggregate extent of private forests is 505,900 acres, of which, by the statistics of 1896, beech (*fagus silvatica*) comprises 44 per cent; oak, ash, maple, birch and alder comprise 18 per cent, and spruce (*picea excelsa*), pine (*pinus sylvestris* and *montana*), silver fir (*abies pectinata*), larch (*larix Europea*), etc., 38 per cent. Three-fourths to four-fifths of these forests are managed on forestry principles. The extent of private forests by the official statistics was, in 1888, 414,837 acres, and, in 1896, 454,874 acres. By the law of September 27, 1805, before mentioned, and which is still in force, private persons are prohibited from cutting their parts of the old forests of the country standing at that time, aggregating at that date an area of about 280,000 acres. This area comprises (besides the old forest area of the state, about 100,000 acres) the remnants of the original forests of the country still existing. Since 1850 very considerable areas have been planted with forests, both by the state and by private persons, especially in the heathy tracts of the peninsula of Jutland. In these tracts an area of 108,500 acres has, since 1868, been planted by private persons, however under the guidance and control of the "Hedeslskabet" (society for the cultivation of heaths), which is aided by the state (for the year 1900 to the extent of $73,000); and of the above area 54,600 acres were thoroughly cultivated at the close of 1898.

FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,600,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,800,000 acres; forests of the municipalietis and of the

public institutions, 4,800,000 acres; forests of individuals, 16,000,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the cork oak (*quercus suber*), the evergreen oak (*quercus ilex*), the cluster pine (*pinus pinaster*) and the Aleppo pine (*pinus halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European oak (*quercus robur*), the European white oak (*quercus pedunculata*), the beech (*fagus silvatica*), the hornbeam (*carpinus betulus*), the common European ash (*fraxinus excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the silver fir (*abies pectinata*), the Norway spruce fir (*abies excelsa*), the beech (*fagus silvatica*), the Scotch pine (*pinus sylvestris*), the mountain pine (*pinus montana*), the larch (*larix Europea*).

STATE FORESTS.

The total area of the forests of the state, 2,800,000 acres, is composed of 2,200,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet)	38,100,000
Fire wood (cubic feet)	64,200,000
Total	102,300,000

This represents nearly an annual production of 46½ cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is $6,000,000, or $2.72 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as $8 per acre.

The expenses are as follows, viz:

Personnel	$1,240,000
Forest instruction	36,000
Sundry works	336,000
Reforesting of mountains	651,000
Taxes paid to departments and municipalities	405,000
Sundry expenses	57,000
Total	$2,725,000

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforesting mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed $1,500,000 or 70 cents per acre. The net annual income of these forests is therefore $2.72 less 70 cents, equal to $2.02 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations approved by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood

they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforesting from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying, and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintainance of forest roads, water sawmills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforesting has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is $10.00 per acre.

The State and Communal forests are organized and managed so as to obtain regeneration by means of natural seeding. A sufficient number of trees are left standing that they may entirely cover the ground with their seed.

It may happen that those trees are thrown down by a hurricane or destroyed by fire. In that case recourse must necessarily be taken to planting, but that case does not often occur. In the private forests the same method is generally applied as in the State and Communal forests. However, as these forests are felled at a very early age, the proprietors must restore them by planting. This only occurs in the regions of plains where pine forests are grown on barren ground with a view of yielding the largest possible revenue.

A forester, with scientific knowledge, *i. e.*, a ranger or assistant conservator (*Garde general ou Inspecteur adjoint* —these two officers fulfilling the same functions) has on an average to administer an area of 19,000 acres of State forests, Communal forest or forests belonging to a public establishment. They generally have at their command three chief guards and ten or twelve forest guards.

Properly speaking, there are no workmen who devote themselves especially to forest work. Most of them only come into the forests in the bad season; in summer time they work in the fields. The number of workmen employed for 1,000 acres can therefore not be given exactly. It varies according to the regions and the longer or shorter time that the workmen devote to the forest work. Many forests being surrounded with villages, many woodcutters repair to their homes every evening. However, when the forests are very large and require work too far situated from the villages, the workmen, in order to avoid too great a loss of time in the morning and evening, construct huts in which they spend the night and cook their meals. The charcoal-burners, obliged to watch day and night over the kilns, always live in the forests.

Very considerable reforesting is made on mountain lands, where the State plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose $700,000 are expended every year, the

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largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The State purchases yearly, on an average, 16,000 acres. The average cost of reforesting is $20 per acre, and $18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 2 conservators, 3 administering general inspectors, 12 inspectors, 7 assistant inspectors and 19 clerks.

An exterior service composed of:

First—Personnel, superior or of administration—32 conservators, 200 inspectors, 210 assistant inspectors, 232 general wardens.

Second—Personnel, inferior or of surveillance—3,650 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director	$3,000
Administrators	$1,800 to 2,600
Conservators	1,600 to 2,400
Inspectors	800 to 1,200
Assistant Inspectors	600 to 800
General Wardens	300 to 520

Exclusive of some additional allowances for traveling expenses.

INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of ..	$160.00
Foremen and wardens paid by the municipal corporations and public institutions	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,800,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,600,000 acres. They produce annually, timber, 45,000,000 cubic feet; fire wood, 125,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 37 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is $6,500,000, or $1.41 gross income per acre. The net income is about $1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the president of the republic. These regulations and those of the state

forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve, and oftentimes leave none at all. One can notice, however, that the principles of sylviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of

drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of $4 to $20, carrying or lighting matches in or within a distance of 20c metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, and telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Al-

geria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of $600,000.

GRAND DUCHY OF HESSE.

The forests of the Grand Duchy of Hesse (population 1,119,893 in 1900), situated in the valleys of the rivers Rhine and Main (on diluvial and alluvial sand), in the Tannus (on slate, Devon), in the Vogelsberg mountains on basalt and red sandstone), and in the Odenwald mountains (on granite and red sandstone) comprise 612,020 acres or 31 per cent of the entire area of the State.

Of this area 177,880 acres are Crown and State forests, managed for and in the interest of the State; 234,955 acres are communal forests, owned by municipalities or public institutions; 135,285 acres are private forests of the 1st class, entailed forests in possession of families, and 63,900 acres are private forests of the 2nd class (ordinary private forest), owned by individuals.

The broad-leaved trees, beech, oak, ash, alder, birch, maple, horn-beam, etc., are covering about 60 per cent of the area under forest, the remaining 40 per cent consist of conifers, pine, spruce, fir, larch, etc.

The average estimated value of the Crown and State forest land is $150 per acre, but there are great differences according to quality of soil, age and condition of growing stock, transportation facilities and density of population.

The annual aggregate expense of administration and protection, for wood-cutting, cultivation, construction and repairing of forest roads, etc., amounted in 1903 to $534,153, and the aggregate net revenue for the same year to $364,191. The average rate of net income is about 2½ per cent.

For regeneration by means of planting and sowing, 3½ million seedlings and 50,000 kilograms of seed of broad-leaved species, 11½ million seedlings and 2,500 kilograms of seed of coniferous species were used at an expense of $65,167. Full reforesting — over the entire surface of the ground — is carried out upon about 700 acres; filling up of blanks in natural or artificial regeneration upon about 2,000 acres per annum. Regeneration by seed dropping from the mother trees is only applied in the case of the beech; in all other cases sowing or planting is resorted to.

Scotch pine seedlings are mostly planted when one year old four feet apart on strips of ground about 12 inches broad and well prepared to a depth of 12 inches. Sowing on similar strips of ground occurs in exceptional cases.

Spruce, fir, white pine and larch are planted when 3 to 4 years of age.

Oak is invariably planted by seed, by setting the acorns from 3 to 4 inches apart, in 3 close rows on strips of ground thoroughly loosened by the hoe. All other broad-leaved species are planted at an age of from 2 to 5 years.

Areas to be replanted after clearing off the mature trees are not allowed to exceed the size of 7 to 8 acres, because larger clearings are considered to be suffering more heavily from drying, from weeds and from increase of injurious insects.

Experiments of cultivating and acclimating foreign species of trees, for instance Douglas fir, red oak, Japanese and Siberian larch, etc., etc., have been so far not discouraging. Common acacia, Canadian poplar and white pine are well naturalized. The culture of Douglas fir is increasing from year to year.

The needed plants are raised in forest nurseries, kept under the care of the local forest rangers. Should the stock not be sufficient, the supply is to be furnished by responsible private nurseries.

The comparatively large areas covered by oak-coppice forest, for obtaining the formerly high priced tanning bark, is decreasing from year to year. The introduction of substitutes for tanning bark has reduced the price of oak-bark to that degree that the working up of it by the present high wages is hardly advisable.

In the southern part of the Odenwald mountains, on the warm, dry and steep slopes of the Neckar valley, where the oak-coppice forest is to be found to a large extent—a section of the country of comparatively poor soil for agriculture—rye and buckwheat are raised for a few years after coppicing the oak. For that purpose the bark and the salable wood being removed and the twigs scattered about, the tract is burned over and the seed grain hoed into the ground. As soon as the sprouts of the oak-stumps have attained the length of a few feet, agricultural use of the ground is given up.

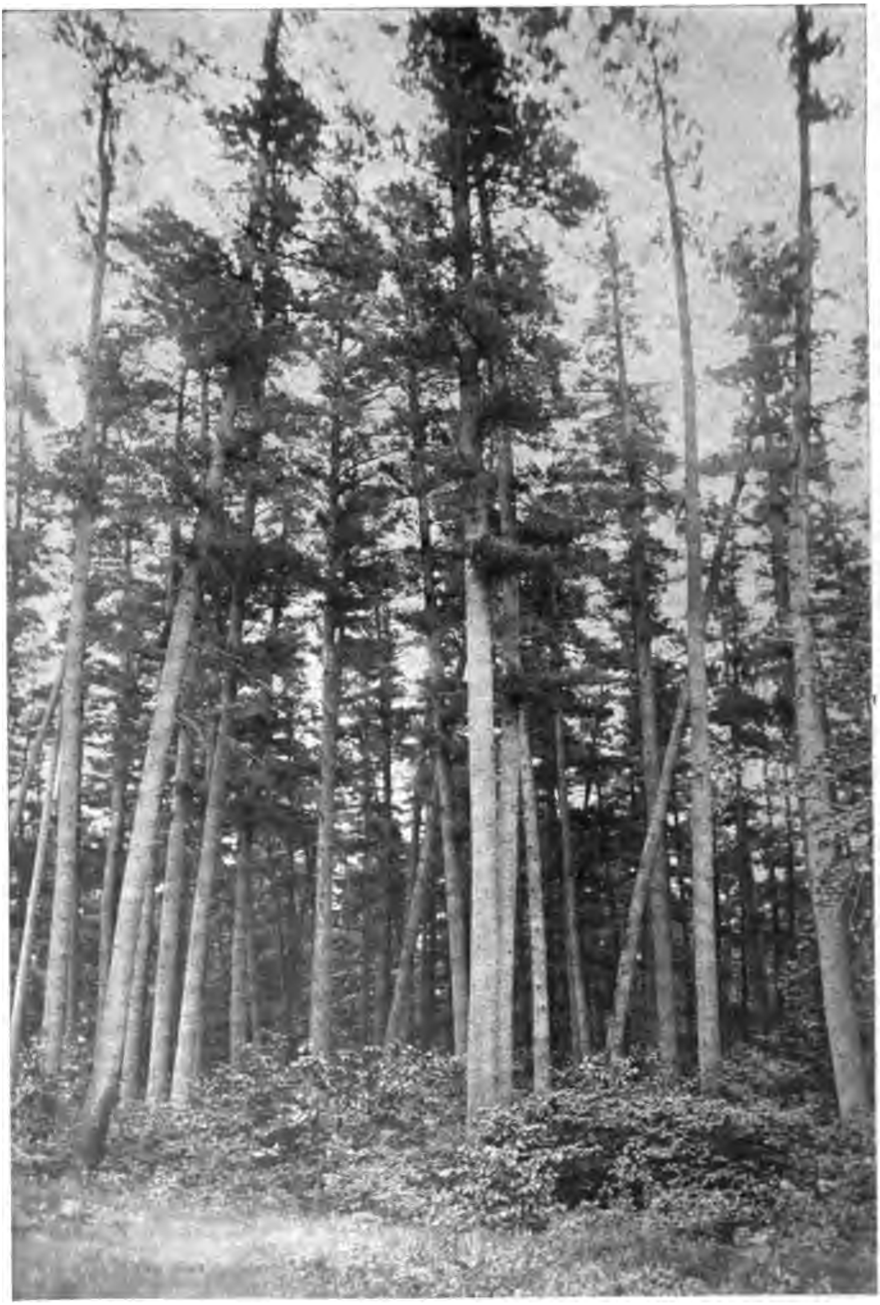
On account of the decline of the price for oak-bark, blanks in oak-coppice forests are no longer filled by oak plants, but in the main by Scotch pine plants. In this way the change of the oak-coppice forest into pine forest is frequently effected, excluding of course, after pine plants have been brought in, any further agricultural use of the forest ground.

Another combination of field crop—potatoes—with forest trees during one or two years following the cutting of mature trees is in some parts of the country customary, less for the object of raising a paying crop of potatoes than for the benefit of the pine seedlings, planted in rows, alternating with rows of potatoes, for which it secures a soil of a high and beneficial porosity. To neutralize the exhaustion of the soil by the potatoes, the elements taken from the soil by that crop are resupplied by artificial manuring.

Reforesting is effected on about 40 per cent of the area by seed from standing trees (beech), on about 10 per cent by coppicing and on about 50 per cent artificially and chiefly planting. The annual yield is strictly sustained and is not allowed to exceed the annual growth. It is made up of material obtained from thinnings (about 40 per cent) and of mature trees (about 60 per cent). The average yield per acre and per annum is 88.6 cubic feet, 75 per cent of which is used as fuel. The average value of cordwood, piled up along forest roads, was in 1903, $6 per cord, the average value of logs, cut and hauled to forest roads, $9.40 per 1,000 feet board measure.

The average proceeds for minor forest products, such as grass, grass seed, litter, stones, etc., etc., are of some significance, while those derived from hunting leases are quite considerable.

The laborers, inhabitants of the neighboring villages, employed in wood-cutting, in culture-work, in building



Natural forest of white pine in the Minnesota National Forest, about four miles east of the village of Cass Lake. It is seldom that natural forest of mature pine is as close standing. These trees are two feet in diameter, breast high, and 80 feet or upwards in height. Photographed, July, 1902.

and repairing forest roads, etc., are earning on the average about 75 cents a day.

The average sum of wages paid annually per 1,000 acres of forest amounts to about $200. By the rate of wages of 75 cents per day, the stated amount represents the working time of one man for 267 days—nearly for one year. Since actually the chief work is performed between fall and spring, a comparatively large force has to be employed during the stated business season, while for the rest of the year the work is rather scarce.

The management of the Crown, State and Communal forests, is performed by the government Oberforster, under supervision of the ministry of finances, section for administration of forest and cameral estates. This section is formed by eight members, to-wit, one Ministerialrat (a forest officer) as chairman, six Oberforstrat and one lawyer.

As stated above, there are 234,955 acres of communal forests owned by municipalities or public institutions and being of the same value as the State forests. They are managed and supervised by the State forest officers; the sale of forest products however lies in the hands of the legal representatives of the proprietors. As an equivalent for managing their forests, the owners have to pay yearly a fixed amount per acre into the State treasury.

The private forests of 1st class (135,285 acres) entailed forests in possession of families and managed on forestry principles by technically and scientifically educated officers, paid by the proprietors, represent a similar value per acre as the State forests.

The remaining 63,900 acres of forests—ordinary private forests—mostly forest lots of small extent, are in the hands of individuals and to a certain extent used at the will of the owners. The condition of that class of forest is usually a poor one, the value considerably lower than that of the other classes of forest, in consequence of abuse by removal of every particle of litter and impoverishment of soil.

In cases when the owner of private forests of the 2nd class is willing to sell his forest lots, and municipalities are not purchasers, the State is mostly a ready buyer.

The damage caused by forest fires is not of very great account. During the years 1903 and 1904 from the total area of forests 143 fires were reported, causing a loss of $3,000. Of these fires, 20 with a loss of $1,175, were caused by railroad locomotive sparks.

Carelessness of smokers visiting the forests for recreation is the principal cause of most of the forest fires and the greatest number of fires occur during the months of April and May, the time of the beginning of vegetation, a season bringing numerous visitors to the forests.

The comparatively small losses caused by visitors has to be placed to the account of the high esthetical worth of the forest, offered to mankind by its majestic beauty, by its pure and refreshing enjoyment.

ITALY.

STATE FORESTS.

The aggregate area of the state forests is 128,960 acres, principally situated in Tuscany—provinces of Florence, Arezzo, Grosseto, Pisa and Leghorn; and Venice—provinces of Belluno, Treviso and Udine. These lands are regarded as inalienable. The prevailing kinds of trees are oak, beech, pine, larch and fir. The total annual expense of administration averages about $80,000. The annual sale of the raw material from the state forests averages $150,000. The number of acres annually reforested with trees is 150. The method of reforesting varies according to the different species of trees and the local conditions; but seeding, whether artificially or naturally, is used only for the oak and the beech For other kinds, such as the fir, pine, larch and chestnut, reforesting is done by planting. Generally good care is taken to maintain a sustained yield. In regard to cutting, the practice is to cut only those trees which have reached fiscal maturity and those that are dead or about to die.

Only a very small number of forest fires are caused by railway locomotives. The forest service has much importance in the protection of mountainous land and in the control of water. The annual salary of the chief inspector of the forests of the first class is 6,000 lire; that of the chief inspector of forests of the second class, 5,000 lire; that of inspector of forests of first class, 4,000 lire. The Minister of Agriculture generally publishes a detailed report on the administration of the forests every five or six years.

NORWAY.

STATE FORESTS.

The extent of the public and semi-public forests, according to the latest returns, cover an area of 546,932 hektars of coniferous trees and 369,967 hektars of foliferous trees (almost exclusively birch), making together 916,899 hektars, estimated at a total value of Kr. 34,720,837, no consideration having been taken to rights of use (usufruct) connected with the forests. The average value of the woodland makes thus about Kr. 37,86 pr. hektar.

The total expenditure in connection with the management and administration of the forests for the financial year 1904–1905 amounted to Kr. 644,700,53, while the revenue yielded by the forests during the same period was Kr. 1,109,147,85.

Of the above expenditure, however, about Kr. 190,000 were paid as grants to private forestry, purchase of woods and other objects, which do not concern the direct management of the public forests.

During the year 1904, 1,529,245 trees were planted out (chiefly pine, *pinus sylvestris*, and spruce, *abies excelsa*,) with which has been covered an area of about 3,058 hektars and 41,30 kilograms of seed have been sown over an area of 21 hektars at a total cost of Kr. 28,883,61.

During the same year ditches have been dug in bogs and sour (seepy) ground and brooks cleared in a length of 91,142 running meters.

The regeneration is effected chiefly by natural seeding from the remaining trees and the mode of felling the trees is mainly on the basis of the selective cutting system.

The staff of the office for woods and forests consists of 1 Skogdirektor (director of forests), 4 Skoginspektorer (inspectors of forests), 26 Skogforvaltere (managers of forests), 1 Skogtaxator (valuer of forests), 4 Skogassistenter (forest assistants), 13 Skogplantere (forest planters) and 418 Skogvogtere (forest keepers). With exception of the forest keepers the whole of the staff is made up of men more or less thoroughly trained for this special line. On each of the "Skogforvalters" to whom the management of the public forests is entrusted, falls on an average 31,415 hektar. The distribution of the area is, however, very uneven.

There are no permanent laborers in connection with the forest and woods office of the State. Provided the trees from the public forests are not sold standing on the root, the felling and the conveyance (transport) of the wood is contracted for, while the planting and sowing, as well as the work in the nurseries, are carried out at daily wages, which as a rule are not higher than the earnings of ordinary day laborers (viz., about Kr. 3.00 a day). Where the forests are situated far away from inhabited places, cabins have been erected for the use of the laborers, and cottages for the staff.

The state has four great and several smaller nurseries, and for the drying of tree seeds two large and four smaller establishments which supply the necessary seed for public use and are also able to set apart a great portion for private consumption, especially of spruce seed.

In accordance with Section 3 of the Act of Storthing of July 20, 1893, rules and regulations for the protection of the forests have up to now been adopted in 77 districts, and in accordance with Section 8 of said Act ordinary forest regulations in 37 districts, together 114 districts.

The majority of these regulations aim at prohibiting the cutting of trees under certain dimensions, still with the modification that cutting of trees not holding the proper measure is allowed in most cases where they have been selected by the oveseer, who is paid by the district in question. The said Act of the Storthing is not considered to allow binding regulations for replanting and sowing of destroyed forests to be included in the above regulations.

In accordance with the Act of Storthing of July 14, 1893, with supplementary Act of July 27, 1896, regulations for the prevention and extinguishment of forest fire have hitherto been adopted in 164 districts. The regutions provide for compulsory attendance of able bodied men in case of forest fire. It has been found that these regulations have greatly contributed to limit the spreading of forest fires.

The State has a High School and two elementary schools which give instructions in forestry. Such instruction is also given by several agricultural schools.

PRIVATE FORESTS.

A society has been formed called "Det norske Skogselskab" (the Norwegian forest society) comprising the whole country with branches in 15 Amter (counties). The society has 18 nurseries and supports about 50 private nurseries. Two establishments for the drying of seeds are in operation. During the year 1904 the forest societies planted out about six million plants and sowed 415 kil. seed by which an area of about 1800 hektar of bare ground is considered to have been cultivated. During the same year ditches have been dug in bogs or in sour (seepy) ground and brooks cleared in a total length of about 259,000 meters or 259 kilometers.

"The Norwegian Forest Society" publishes a journa for forestry, of which 5,400 copies have been printed and is published monthly. In addition thereto a review "Forstligt Tidsskrift" is published by two graduates in forestry for their own account, and which is published n quarterly issues.

In order to assist private people in the management of their forests, 11 Amtskogmestere (district inspectors of forests) have been appointed, whose salary and traveling expenses are defrayed one-half by the State, whereas the other half is paid by the county in question.

PRUSSIA.

STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres, making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to $700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum, $8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to $17,200,000, being at the net rate of $1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The area of evergreen forests annually reforested from self-sown seeds is extremely small in comparison with the sections which are replanted either by seeds or seedlings. In the case of Scotch pine (*Pinus sylvestris*) artificial regeneration by seeds or seedlings forms the rule. An exception is made only within a small territory where the June bug (*Melolontha vulgaris*) has appeared, during the last years, doing considerable damage in the eastern part of Prussia (Heath Forests, Johannisburger Heide). The natural regeneration of the Scotch pine has been adopted

h in this territory as a means of preventing the attacks of the June bug. When the June-bug-danger has passed by, we shall return without a doubt, to artificial regeneration of Pine. The natural regeneration of conifers prevails, however, preferably within the mountain forests, where regeneration of the Silver Fir (*Abies pectinata)* is concerned.

The foresting of the beech is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. In regard to the continuity of forest products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875, the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning. During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforster" (district manager) ranges according to length of service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

The average size of State Forests placed in charge of a scientifically trained forester amounts to 9750 acres. Within the entire State Forests, during the year 1904, there were employed 156,772 workmen (and workwomen) working on 10,479,589 workdays. In other words, there have been employed, per 1,000 acres of State Forests, 22 workmen (and workwomen) engaged on 145 workdays.

The workmen obtain a sufficient wage scale. In order to attach the workmen and their interests to the forest, a number of small farms are being leased to them at a cheap price. Within the entire State Forest Administration of Prussia, there are kept, altogether, 631 houses for forest workmen, containing 1323 dwellings.

PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of $1.50 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

FORESTRY IN RUSSIA.

At my request the American ambassador at St. Petersburg, Mr. Riddle, has kindly furnished me information on forestry in Russia. It is probably not generally known in this country that scientific forestry was introduced in Russia as early as 1820; and that a school for scientific instruction in forestry is maintained at St. Petersburg attended by 565 students. For the support of this school the Russian government expends annually $93,250.50, and the students $17,643.50. Besides, there are in the empire 32 lower grade schools for forestry instruction with 580 students. The state forests comprise the enormous

area of 634,143,918 acres, the merchantable timber on which is sold under sealed bids. The expense of administration averages about $5,570,773 annually. The revenue in 1904 amounted to $24,650,278. Selection cutting is mostly practiced. In 1905, 21,241 acres were artificially planted and 126,052 acres started for replanting. The forests at present are under the charge of 1,237 scientifically trained foresters.

The following are the questions I submitted and the answers that were furnished:

Question 1.—Area of the productive state forests of Russia, character of surface and soil and prevailing kind of trees? Area:—

Siberia	102,600,000	acres.
Caucasus	19,353,918	"
Russia in Europe	461,700,000	"
Finland	50,490,000	"

Soil:—Generally sandy-clay.
Species:—Pine, fir, oak and birch.

Question 2.—Average number of feet of timber annually cut therefrom; average age of pine when cut and diameter breast high at such age?

No accurate reply can be made to the first part of this question, as the acreage of all the forest land in the empire (especially in Russia in Asia) is unknown; there is likewise no information relative to the mass of trees cut each year on private forest estates, the acreage of which in Russia in Europe amounts to 108,000,000 acres. In view of this only the amount of timber obtained from state forests can be given. The Report for 1905 shows that out of 286,427,665 acres of state forests in Russia in Europe 4,802,412 cubic fathoms (7 feet) of timber were cut from 229,532,232 acres; about 22 percent of this amount was received from the forests of Northern Russia, namely, the provinces of Archangel, Vologda, Perm Olonets and Viatka, covering an area of 247,702,139 acres, which in 1905 yielded 1,062,304 cubic fathoms of timber. Furthermore, in the Caucasus, 13,418,327 acres of state forests, with good forest land covering 8,454,607 acres, yielded 132,463 cubic fathoms of timber, and in Russia in Asia 361,945,497 acres of forests belonging to the state, of which 129,169,881 acres are good forest land, yielded 607,595 cubic fathoms of timber. Thus all the State forests in the empire, covering 661,792,491 acres, yielded in 1905 5,542,470 cubic fathoms of timber.

With regard to the average age of pine when cut, this can only be approximately defined, according to the manner in which the forests are cleared, namely: whether the whole forest is cut down or whether only chosen trees are cut.

Generally in Russia in Europe the age of the trees felled is: for pine, from 80, 100, 120 and 150 years; for oak, 60, 80, 100, 120 and 150 years; for fir, 60, 80 and 100 years. For private forest landowners the forestry laws are applied, and the age for oak is 40 years; while that of other leaf trees is fixed at 30 years. The forests mortgaged in the Nobility Land Bank enforce in European Russia, in the North, the age of 100 years; in Central Russia, 80 years; in Southern Russia, 70 years; for oak 120 to 80 years, when bad growth, 40 years; for birch, poplar and alder, from 30, 40 to 50 years. In the state forests the age for cutting is fixed: for oak, from 80 to 120 years, and for other species, from 40 to 60 years.

With regard to the diameter of trees cut, an average cannot be properly given, as it varies so greatly, in view of the age, degree of intensity of the growth, local requirements, etc. In properly managed estates, the trees cut have dimensions from 1¾ to 17½ and 26¼ inches. In

Northern Russia the diameter of coniferous trees, the pine and fir tree, sent to the market at Archangel and obtained from the provinces of Archangel and Vologda, varies from 14 inches to 15¾ inches breast high, while trees of 21 inches and even 26¼ inches in diameter are found. The average diameter of oak trees is also difficult to establish, but it may be fixed at 15¾ to 21 inches, while gigantic oaks are found having from 43¾ to 52½ inches in diameter breast high.

Question 3.—Explain briefly the way in which the state sells its standing timber?

Notwithstanding the growing importance which the exploitation of forests has taken in Russia it rarely occurs that the proprietors manage their own estates; the forests are generally divided into small lots and sold to the highest bidder. The sale of forests belonging to the Domains and the Imperial Cabinet are generally advertised for sale, six months in advance. The bidders present their offers in sealed envelopes which are opened on a day fixed for this purpose in their presence. They may make bids for a number of lots or for the whole forest, depositing from 10 to 20 per cent of the contract value as guarantee for the proper execution of the contract.

The party who has made the highest bid receives the permit to cut the trees, and, if he deposits the entire value of the contract, he receives the permit to carry away the timber. The trees are cut down for the most part in Russia from October 28th to March 28th. Hand labor is abundant in the north of Russia, where forestry constitutes the main resource of existence of the population, as well as in the central and western provinces, where the peasants have no other winter labor. Labor is paid by tree or beam or rafter, or by the fathom for wood to be used as fuel. The average day costs from 45 to 50 copeks

(22½ tc 25 cents) per laborer in the basin of the Vistula, while it becomes less, being 20 cents per day in the eastern provinces, and runs up as high as 35 and 45 cents per day in unpopulated districts. Generally the laborers form themselves into an "Artel" or association having a "starosta" or "senior" at the head, which directs the work and acts as intermediary between the agents and laborers.

Question 4.—What is the annual expense of administering the state forests, and does such expense include forestry instruction and the purchase of additional lands?

The expense of administering the State forests including expenses of forestry instruction amounted in 1904, and is about an average, to $5,570,773.

Question 5.—Amount of annual revenue?

The revenues from the State forests in 1904 amounted to $24,650,278.

Question 6.—Is clear cutting or selection cutting mostly practiced?

In state forests selection cutting is mostly practiced.

Question 7.—About what proportion of cut over land becomes reforested by natural seeding and what by artificial planting or sowing?

The report of state forests for 1905 shows that the state, when it sells its forests to private parties for exploitation, receives from the purchaser a pecuniary guarantee for the proper and full exploitation of the contract. And these sums when not returned to the contractors on account of improper fulfilment of their contract, form a fund used in reforesting or planting forests. Thus in 1905 from the sums thus obtained and from credits obtained for that purpose: (a) 21,241 acres were artificially planted; (b) 7,290 acres of planting were finished; (c) 126,052 acres were started for replanting; (d) 105,799 acres were worked at, and (e) 38,383 acres already planted received supple-

mentary work. In forest lands belonging to private owners in Russia in Europe out of 39,906 acres 32 per cent were replanted and 68 per cent sown.

Question 8.—How many acres are annually planted?

The answer to this question was included in No. 7.

Question 9.—What is generally the age of the plants; how many feet apart are they planted; how many men, women or children does it take to plant an acre per day and at what expense?

The age of the plants which are transferred from the nursery devoted specially to the cultivation of various kinds of trees, is as follows: the pine, generally from one to two years of age; the fir, 2 to 3 years old; the oak, from 2 to 3 years old; other leaf trees from 1 to 2 years old.

The method of planting pine and fir trees in Russia is in squares, the trees being planted in rows, the rows and trees being 42 inches apart. The forests are also planted in rows 56 inches apart, the trees therein being 28 inches apart. In the first instance 9600 young trees are planted on 2.7 acres, and in the second instance 2.7 acres contain 10,800 trees. Oak and other leaf trees are planted in rows 56 inches apart, the trees being 28 inches apart.

The cost of this work depends upon many conditions: the quality of the soil, the degree of readiness of the soil, the distance of the nurseries from the ground to be planted, herefore it is preferable to give several instances which characterize the amount of labor required. These instances have been chosen from reforesting effected in the province of Voronege (Central Russia).

1.—The planting of pine trees in sandy and sub-sandy prepared soil, 1 to 2 year trees in rows 56 inches apart and 28 inches distance between trees, placing one or two trees in each hole, transported over a distance of from ⅔

to 5⅓ miles; including the digging of the holes, the force employed per deciatine (2.7 acres) was: for laborers with horses 0.35 to 0.40; for laborers without horses from 3.5 to 3.6, and for women from 2.5 to 2.9.

2.—The planting of pine, same soil as above, in furrows ploughed out 42 inches apart, digging up the young trees and transporting them over a distance of from ⅓ to 2 miles; digging holes with spades in furrows and planting the trees, the force expended per deciatine (2.7 acres) was: for laborers with horses 0.65 to 0.90 and for common laborers without horses 2.9 to 5.9 and women from 8.6 to 15.2.

3.—Planting 1 to 2 year old oak trees at the rate of 1200 per deciatine (2.7 acres) in firm soil (black clay), one or two trees in each hole dug out by spade, each hole being 6 vershoks (10½ inches) deep, the force expended was: men with horses from 0.12, men without horses from 1.3 to 4.5 and women from 12.5 to 13.8.

4.—The planting of 1 to 2 year old oak, 400 to the deciatine (2.7 acres), cost force per deciatine: laborers with horses 2.9, without horses 8.8 to 12.0 and women 5.8 to 6.2.

The planting of trees in the black soil steppes of Southern Russia, at the rate of 10,800 trees from 1 to 3 years old per deciatine (2.7 acres), requires about 1 man with a horse, 10 men without horses and 12 women.

With regard to the cost of the above named work, it varies greatly according to the price of làbor in the different localities. In the province of Voronege the cost of labor is from 50 to 75 cents per day for a man with a horse; 20 cents for men without horses and from 15 to 20 cents for women.

Question 10.—Annual amount of damage by forest fires? Means taken for preventing and extinguishment of forest fires?

In 1904 the amount of damages in the forests by fire and other reasons, was as follows:

Loss caused by fire	$84,930.50
Loss caused by insects	24,068.50
Loss caused by floods	1,039.50
Loss caused by snow storms	10,098.50
Loss csused by wind	33,147.00
Loss caused by other reasons	6,566.00
Total loss	$159,852.00

The means taken for preventing and extinguishment of forest fires is not stated.

Question 11.—Number of persons annually employed in the state forests and average number of days in a year; and about what number of them reside in or near the forests?

In reply to the first portion of this question it is necessary to state that nearly all the lumber obtained from the state forests is used either for the requirement of the peasant population or is sold by auction, so that both the peasants and contractors work the forests with their own laborers; on this account the Forestry Department does not employ laborers for the state forests, and when it does employ laborers it is for timber required for its own use (valued of about 2½ million dollars per annum), as well as for reforesting purposes.

The second portion of the question is so indefinite that it is difficult to give a reply. If this question is made in order to ascertain the relation between the forest area and population in various parts of the empire we then refer to the information on this subject contained in the copy of the "Forests of Russia," edited for the Universal Paris Exhibition in 1900. (This book has been forwarded.)

Questions 12 and 13.—On an average how many acres are under the supervision of a scientifically educated for-

ester? What is his pay and allowance? After how many years service does he receive a pension and at what rate? Also: What is the title, rank and pay of the highest class of forest officials?

If the first portion of this question refers to the average number of state foresters employed in Russia, the reply is included in the Forestry Report for 1905, namely: 1237 foresters, of which 996 in Russia in Europe, 87 in the Caucasus and 154 in Russia in Asia. The area of the forests under their control would be as follows: In the north of Russia in Europe, the average area of forestry would vary from 2,970,000 acres in the province of Archangel to 245,592 acres in the province of Viatka, while in the Caucasus the area is, for instance, 147,420 acres, and in Russia in Asia 2,430,000 acres.

Foresters are divided into two categories (I. Class and II. Class). Forest Inspectors into "Seniors" and "Juniors". The duties of the latter are to inspect and control from 2 to 4 foresters in their district. At present the majority of crown foresters have acquired the highest forestry instruction, and the average number, lower instruction. Inspectors have assistants which have obtained the highest degrees in forestry. In 1905 there were 253 assistants and 1386 forest "conductors" or guides.

The pay of local foresters serving the crown varies according to the condition of their duties and may be expressed as given below:

Senior forest inspectors		$1250.00
Junior forest inspectors		1075.00
Foresters I class	from $725 to	875.00
Foresters II class	from 600 to	750.00
Assistant foresters	from 275 to	400.00
Forest guides	from 200 to	350.00

These amounts include from $75.00 to $250.00 for expenses of displacement.

With regard to pensions it must be said that they have to serve 35 years, but a portion of the pension is granted to persons who have served less time, according to categories: up to 15 years, from 15 to 25 years and from 25 to 35 years.

The amount of pension they receive is worked out as follows: ¼ of their pay when they have served 15 years; ⅓ when they have served from 15 to 25 years, ½ for 25 to 35 years service, and ⅔ of their annual pay for 35 or more years service.

The rates of pensions for 35 years or more service, are fixed as follows:

Senior forest inspectors	$600.00
Junior forest inspectors	500.00
Foresters of I class	400.00
Foresters of II class	350.00
Assistant foresters	200.00
Forest guides	125.00

It must be remarked that according to the laws in force foresters (as well as inspectors) and their assistants have the special privilege of receiving land, the proportion being from 81 to 121½ acres for foresters and inspectors and 40½ acres for forest assistants. Besides, many foresters, inspectors and their assistants receive dwellings in houses belonging to the Government and purposely built for them; those who do not receive free dwellings are made a special allowance therefor. Fuel is granted to all in proper quantities.

Question 14.—When was forestry first introduced into the management of state forests?

In 1820.

Question 15.—What are the colleges or schools for scientific forestry instruction and aggregate number of students attending; also, number of forestry schools of lower grade and number of students attending?

There is, so far, only one college for scientific forestry instruction, which is known as the "Institut du Corps Forestier" in St. Petersburg, which had last year 515 students on January 1st, this number was increased during the year by 169 more; 64 students graduated and 55 left for various reasons, thus on January 1, 1907, there were 565 students as follows: 181 in the I class, 154 in the II class, 127 in the III class and 103 in the IV class. The whole course lasts four years. The maintenance of this college costs annually $110,894, of which sum the government pays $93,250.50 and the students $17,643.50.

Besides, there are 32 lower grade schools in both Russia in Europe and Russia in Asia, with 580 students. At the beginning of the present year 1162 students presented themselves but only 255 were accepted. The maintenance of these schools costs the government $78,827.00.

DUCHY OF SAX-MEININGEN.

The area of state forests is 106,530 acres; of communal forests, 84,460 acres; of private forests, 71,850 acres; miscellaneous, 1,480 acres; in the aggregate, 264,310 acres, being equal to 42.4 per cent of the total area of the state. The state forests comprise 24 units of administration, in charge of 24 superior forest officers. The highest functionary in forestry matters is the president of the forestry bureau. The bureau is composed of five forest councillors, two of whom act as forest inspectors at the same time, each one supervising 12 of the above named 24 forest officers. The annual yield of the state forests is 5,779,669 cubic feet of lumber and fire-wood cut in ripe forests, and 1,288,904 cubic feet of fire-wood and pulp-wood obtained from thinnings. These figures correspond with an annual yield of about 155 feet board measure of lumber plus 0.40 cords of fire-wood per acre per annum. The state forest officers at the same time control the management of the communal and private forests within the state. All grades of forest officers have certain police duties concerning forests, fish and game preservation.

The regeneration of cutover Silver Fir (*Abies pectinata*) forests is obtained principally from self-sown seed. The Silver Fir is planted only where the species is absent at the present moment, and where the admixture of the species with other kinds already at hand appears to be desirable.

The reforestation of Norway Spruce (*Picea excelsa*) is obtained usually by the planting of seedlings. Still, wherever advance growth, starting from self-sown seed, is found to be at hand in suitable groups and bunches, there such advance growth might be used to good advantage as a means of partial regeneration.

The regeneration of Scotch Pine (*Pinus sylvestris*) is effected partly by the planting of seed and partly by the planting of seedlings.

All State Forests and Communal Forests—the latter being the property of towns, villages, cities, corporations or of funds of an educational or religious character—are administered by and are placed in charge of forest officials possessing a thorough, scientific and technical education in forestry.

The number of the forest workmen continuously employed in the forest changes from time to time. On the

1st of October, 1905, there were employed, altogether, 844 workmen. These workmen are domiciled, usually, in the nearby villages.

SAXONY.

STATE FOREST.

The aggregate area of the state forest is 442,000 acres. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,637.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 235,000 acres. The second group, in the outskirts of the Erz mountains and in some smaller distinct mountain ranges, comprises 113,000 acres; and the third group, in the plains, comprises 94,000 acres. The soil consists of decomposed granite, granulite, gneis; mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might·be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus sylvestris* (L.); silver fir, *abies pectinata* (D. C.); larch, *larixeuropæa* (D. C.); rotbuche, *fagus silvatica* (L.); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L.), *a. platanoides* (L.); further, several species of elm, *ulmus;* of birch, *betula;* and of linden, *tilia.* The prevailing species is spruce.

The value of the state forests, including timber and soil, aggregates 1903, $86,306,000. Hence the value per acre is $195. The annual expenses for administration for the year 1903 were $1,270,800. In the year 1903 the annual gross revenue amounted to $3,338,500; the annual net revenue to $2,067,700.

The entire area planted annually varies according to circumstances. On the average it will reach 6,500 acres. Of these 6,500 acres 500 acres are planted up with seeds and 6,000 acres are planted up with plants. The question whether plants or seeds shall be employed for restocking cleared ground depends on the condition of the soil. As a general rule, seeds are planted only on such areas which do not produce grass and weeds to a large extent and which at the same time are of sufficient fertility and well protected against late frost. The sowing or planting of seeds must be done not later than in the second year after the final removal of the former tree crop. Strips about three feet wide or places about six feet square are cultivated with a spade before the seed is thrown on them. Only in rare cases the entire area to be planted with seeds is ploughed and harrowed and the seeds spread over it broadcast. The plants used for planting up a clearing are as a rule two years old or older. The age of the plants selected depends on the condition of the area to be planted aside from depending on the species itself. Spruce, Scotch pine, fir and larch, as a general rule, are used two to five years old; beech, oak, ash and maple, as a general rule, are used three to six years old. The plants are raised in nurseries. Only in rare cases they are taken from areas previously planted with seed in the open forest. The number of plants used per acre ranges between 1500 and 2500, according to the species, the size of the plants used and the condition of the area to be planted.

Regeneration from self-sown seed is only used in the case of the beech (*Fagus silvatica*) and of the silverfir (*Abies pectinata*). In all other cases forests are regenerated by means of planting plants or sowing seeds.

There is no law or rule in Saxony for compulsory reforestation after clearings.

There is not much damage done by forest fires. It averages $300 per year. Forest fires of a larger extent have happened very rarely. As a rule, forest fires are caused by the careless use of matches by tobacco and some cigar smokers. Fires are caused by sparks from locomotives; on the average perhaps ten per year.

The yield or annual cut is fixed by working plans prepared for periods of ten years and renewed after the lapse of such periods. Within these periods the annual yield is almost constant. At the end of a period, however, a new working plan might provide for either a higher or lesser yield. It is an iron-clad rule that on the whole the cut shall not exceed the increment of the forest.

Trees are cut as low down as possible above the surface of the soil; the instrument used is the saw. The stump and the root are dug out afterwards wherever such work is remunerative, viz., where the wood obtained can be sold at a paying rate. In Saxony regular forest management began with the beginning of the nineteenth century in a systematic way; hence there is no objection to clearing an entire area of given size, say of two or three acres, at once, removing from it every tree standing on it. In exceptional cases, pieces of forest not entirely mature may be sacrificed with a view of saving others from the dangers threatening from storms.

The average age of maturity in Saxony for conifers (spruce) is eighty to ninety years. However, there are cases in which this rule is not adhered to. The size of trees when fit for the axe depends entirely on the species, on the condition of the locality, the means of transportation, etc. Previous to the final cutting, and beginning with the twenty-fifth year of a piece of forest, and ending at the sixtieth year of the forest, thinnings take place at intervals of about ten years with a view to allow increased light and increased space to the most promising specimens of the growing stock. Specimens growing less vigorously, dying or dead, are removed at the same time wherever it pays.

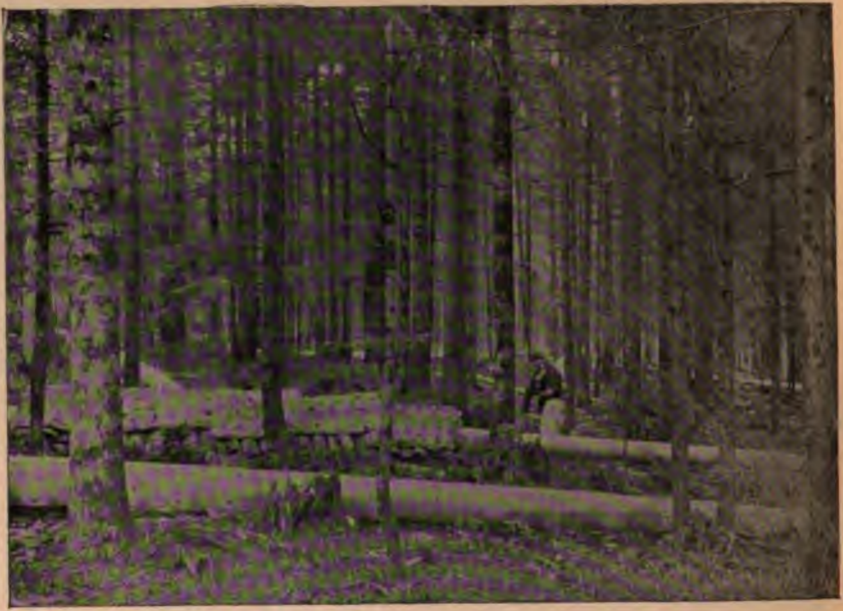
There is no difference in the rank of the forest officer compared to that of any other state officers employed in the technical branches of the government. The state forestry service is divided into a lower and higher branch. The professional training for the first one is a merely practical training, whilst the latter necessitates scientific preparation of a high class. The requirements with reference to this scientific preparation are as follows: Graduating from a state gymnasium; twelve months' study at a university; three years study at the forest academy at Tharandt, at which two examinations must be passed; three years of practical professional training under a forest officer and at the bureau of forest working plans at Dresden; examination by the state authorities. After this preparation, as soon as there is a vacancy, appointment as government officer might follow, to begin with as assistant of an Oberförster (Superior Forester); then as superior forester, and so on up to the higher ranks of chief of a forest territory or chief of the bureau of forest working plans. The latter officers have the title of "Superior Forest Master." The highest technical authority controlling the local and territorial officers is called "State Forest Master." There are 109 local ranges in Saxony allotted to 17 territorial districts. The former are in charge of a superior forester (Oberförster), the latter in charge of a superior forest master. The central bureau of the entire state forestry service is under the Secretary of Finances.

The salary of a superior forest officer averages $1,075 (from $900 to $1,250), to which must be added an allowance of $600 for traveling expenses, horse keeping and the use of a house free of rental. The salary of the Superior forest master averages $1,524, ranging from $1,500 to $1,800, to which must be added a traveling allowance of $1,200 and the use of a house free of charge.

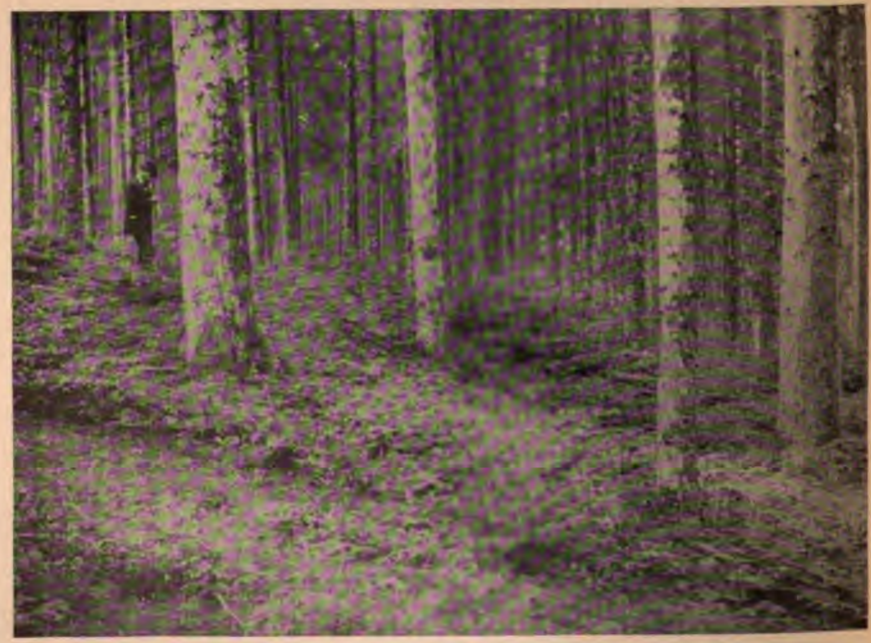
In the case of physical disability the forest officers draw a pension depending on the duration of their state service and on the salary received so far. This pension is at least 30 per cent of the salary. In no case does it amount to over 80 per cent. The latter figure is paid after 40 years or more of state forestry service. At the age of sixty-five years the state forestry officer is entitled to a pension in case he desires to retire, even if his constitution would enable him to continue in the service.

An annual report of the Saxony forest administration is published in the "Tharandter forstliches Jahrbuch." This periodical is a distinguished periodical on forestry.

As further information, it may be stated that the administration of a forest range, by the superior forester under the supervision of the superior forest master, is outlined by "the working plan" which is prepared by the bureau of forest working plans at Dresden, containing prescriptions for a period of ten years. The superior forest officer co-operates in the preparation of this working plan, which has to be submitted to the secretary of finances. The preparation of a working plan is based on a thorough knowledge and a thorough scrutinizing of the conditions of the forest range, which often takes several months. The forest working plan contains a statement showing the areas of the different compartments or units of the forest range; it contains a description of these com-



Private forest of spruce and fir in Germany. Light cutting just made of largest trees. A "Selection forest," in which the large trees are cut and the smaller ones left to grow. Engraved for the Annual Report of the Forestry Commissioner of Minnesota.



Spruce and fir forest near Freudenstadt, Wurtemberg, Germany; age about 130 years. Shows how closely land becomes stocked with trees under scientific forestry management. Also shows undergrowth about six inches high. Minnesota's natural resources are so great that, if she would now begin to spend annually $300,000 in forestry, she would in eighty years have 3,000,000 acres of as good forest on land not suited for agriculture, and of the value of $200,000,000 and upwards.

partments and maps of the same; all sections of the forests are examined with reference to their increment. All these investigations made, the forests or sections of forests to be cut during the next decade of years are selected and pointed out specifically. Further, there is stated specifically what compartments or sub-compartments are to be thinned out, what areas are to be planted up, and by what means regeneration is to be effected in each single case. Deviations from the prescriptions of a forest working plan must not be made unless authorized by the secretary of finances. Every working plan is controlled by the state forest master in the range itself. Besides, in the midst of the ten years period, or after the lapse of five years, such a control by the highest forest officer of the state takes place, so as to find out whether and in how far the prescriptions of the working plan have been followed and whether deviations might be advisable.

The sale of the forest produce (timber, fuel, bark, stones, etc.) is done by the superior forest officer with the help of a local state cashier, who is holding an office absolutely independent from the forestry service and is directly subordinate to the secretary of finances. This arrangement makes embezzlements practically impossible. The sale of timber and fuel takes place, after they are cut and piled up, by means of public auction. The cutting and piling of timber and fuel is done by common hands working under a contract. Any planting, on the other hand, is done by day workers, under the supervision of the local rangers, so as to warrant careful work.

PRIVATE FORESTS.

According to a statement made for the year 1900, the total area of the private and communal forests in Saxony is 520,000 acres. All forests owned by municipalities and villages and other corporations, and a considerable fraction of the larger private forests, are managed according to true forestry principles. The administrations of municipal, town and village forests, also the administrations of the private forests, are not controlled by the state, but the bureau of forest working plans at Dresden prepares the working plans for the larger of these forests.

It is impossible to give any data as to the average value per acre of communal and private forests. Neither are data available as to their average annual yield. Generally speaking, the yield of private and communal forests is considered to be lower than from state forests. Wherever there are working plans the cut is steady and even during the period over which the working plan extends. Where there are no working plans the cut depends entirely on the pleasure of the owner.

Small holdings of forests, especially those of the peasantry, are deteriorating. Parts of such forests are changed into fields or meadows; other sections are purchased by the state, communities or wealthy private individuals.

GRAND DUCHY OF SAXE-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres; in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working Plans," at Eisenach, the director of the forest academy being at the same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property; maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintainance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

SWEDEN.

STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is $4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was $185,397, and the aggregate revenue was $1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about $10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägmästare," with annual salary of $1,707 and rank corresponding to the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of $1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of $160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of $2,400, and having rank corresponding to that of a major general in the army; and a chief of bureau, with salary of $1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about $5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote re-growth of private forests.

FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000 acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area, not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive surface of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Rämen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500 feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harfjellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a "fjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

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*Information furnished in Swedish by Dr. Fredrik Loven, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each, and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one or two cows and several smaller animals are fed. About

14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years, which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural seeding. The cuttings are not so large but what the bystanding trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches,. 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than 100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to $0.85).

The income from game is not large. There are shot annually 12 elks, many hares and game birds.

SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. In conformity with the prescriptions of the federal law of October 11, 1904, all forests of Switzerland are placed under the supervision of the Confederation.

The Confederation itself is not actually the owner of any forests, but some of the separate states are owners. The forest domains are part of the national wealth, and comprise 96,497 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,414,677 acres. Besides there are private forests comprising 604,014 acres. The total area of forests is therefore 2,115,188 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in the high mountains. Forests are found standing at 200 meters above the sea level (in the canton of Tenin) and reach as high as 2,100 meters in the high mountains. In Grisons (Engadine) they even reach 2,300 meters in altitude.

The more common varities of trees are among the resinous kinds, the Norway Spruce (Picea excelsa) the Silver Fir (Abies pectinata) the Larch, the Scotch and Mountain pines, the Cimbrian pine; among the deciduous kinds, the beech and the chestnut trees; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value of per hectare (2½ acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1904 the expenses incurred by the Confederation for forest administration amounted to $112,600.

The following were the net receipts from State Forests in 1903 as to a few cantons:

Berne, 787,000 francs or 60 francs per hectare of forest.

Soleure, 31,500 francs or 38.33 francs per hectare of forest.

St. Gall, 58,000 francs or 59.62 francs per hectare of forest.

Schaffhouse, 113,100 francs or 45.33 francs per hectare of forest.

Argovie, 151,600 francs or 49.73 francs per hectare of forest.

Thurgovie, 83,000 francs or 65.90 francs per hectare of forest.

Neuchatel, 58,000 francs or 30.26 francs per hectare of forest.

The net receipts from towns of their forests in 1903 were:

Winterthur, 99,100 francs or 91.07 francs per hectare forest.

Schaffhouse, 35,000 francs or 77.05 francs per hectare of forest.

St. Gall, 104,800 francs or 144.36 francs per hectare of forest.

Coire, 49,200 francs or 43.65 francs per hectare of forest.

On an average about 593 acres of forest have been created annually during the past thirty years, at the expense of the Confederation, the cantons and the owners of the grounds.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective.

In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-sliding, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforesting by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislatures prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, as high-forest, coppice with standards and coppice.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested, except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed in courses lasting two months is attached to this technical personnel and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterthur Fribourg, Coire, Soleure, Schaffhouse

The Chief Federal Inspector of Forests has an annual salary of 8.000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed, his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall who has a salary of 5,000 francs, receives twelve francs per day and five francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the forest is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare. In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines), and which forms a sort of a triangle, lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

STATE FORESTS.

The Government forests occupy one-third of the entire forest area of the Kingdom and comprise 420,000 acres, namely:

Oak, 2 per cent; beech, 26 per cent; Scotch pine, 10 per cent; Norway spruce, 44 per cent; silver fir, 15 per cent; maple, ash, walnut, etc., 2 per cent.

The price of the forest land from which the timber is cut, varies according to local conditions and amounts, on the whole, to $35 or $40 per acre.

During the period 1893 to 1903, the Government bought annually about 250 acres of forest land for the purpose of the enlargement of its possessions; and, further, with a view to obtaining possession of solid boundaries of land.

The annual aggregate expense of administration of the forest amounts to $1,183,574. Of this $364,140 is paid to wood-cutters, $147,560 is expended on roads, $90,440 in forest culture, $259,468 for pay of officials, $148,468 for forest guards. The revenue was $2,928,352, yielding a net revenue, after for 1895-1896 deducting all expenditures, of $1,744,788, or $3.63 per acre. The number of acres annually sown to forest is 296, and the number of acres planted to forest 6,177.

About one-fifth of the state forests is regenerated from self-sown seed, whilst the remaining four-fifths are regenerated by the planting of seedlings.

It is a principle to maintain (as far as the division of the age of the plantings permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic meters per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings.

The Government officer, in forestry, has placed in his charge about 3300 acres of state forests, in addition to the management of, approximately, 2700 acres of communal forests. The State Forest officer, at the same time, is placed in charge of the forest policy of the state, under

Working in the tree nursery at Freudenstadt, in the "Black Forest," Wurtemberg, Germany.

Chief forester, his assistant and a forest overseer or guard. A shelter for men and tools, alongside a main forest road. In Germany.

the law of Feb. 19th, 1902; and in this capacity, prevents the mismanagement of protection forests.

The headquarters staff comprise, 1 President; 12 Technical Foresters (including the Commander of the Forest Guard); 2 Members, attending to the financial side, budgets, etc.; 1 Member, attending to buildings; 1 Member, attending to local matters. The salary of the President is $2000. The salaries of the other members, known as "Councilors", vary between $1350 and $1810 per annum.

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said that the forest officials rank in general equally with those state officials who are graduates of the university.

Workmen continuously employed in the forests are used only in a few large forest districts, notably, in certain parts of the Black Forest; otherwise, forestal labor is attended to by men usually employed in other vocations. Only in the case of workmen permanently employed, attention is paid to the proximity of home and Forest.

On 2500 acres of forest land, about 12 workmen may be employed during the entire year. The wages of the forest workmen are somewhat better than those of the common workmen, in order to retain the necessary amount of good labor for forestry.

During the years 1901 to 1905, there occurred altogether 124 forest fires. The damage caused by these forest fires was as follows: 2 forest fires, each $300; 17 forest fires, each between $25 and $250; 105 forest fires, less than $25 altogether.

The entire damage done by forest fires within the state forests of the Kingdom of Wurtemburg, and within the period of 1901-1905, amounts to $2200.

The main causes of such forest fires are carelessness while smoking and lighting fires near forests. Forest fires are very rarely caused by sparks from locomotives

FORESTS OWNED BY CORPORATIONS.

These forests are about as extensive within the Kingdom of Wurtemburg as the Government forests proper. They are owned by municipalities, towns and such institutions as may follow out public purposes, and are subject as such to Government control.

The arrangement of supervision and management at headquarters, in the case of Corporation Forests, is the following: 1 President; 12 Technical officers (the same men who form part of the State forest management); 4 members, having particular experience in the administration of communal matters.

Corporation forests must be managed, on the basis of forest working plans, in such a manner that a sustained annual yield is obtained under the local supervision of foresters who have obtained the training prescribed for for State forest service.

PRIVATE FORESTS.

The forest area contained in private forests comprises 36 per cent of the forest area of the Kingdom or 537,000 acres. Approximately 200,000 acres, out of the total number of private forests, are placed under the management of trained foresters, whilst the management of the rest is merely limited by the law of Feb. 19., 1902, known as the law on Forest Policy.

According to this law, in the case of forests playing the the role of protection forests, and being essential as such for the benefit of the commonwealth in safeguarding the interests of the lowland no clear cutting and no very heavy thinning is allowed without the consent of the forest political authorities. These officials, at the same time, see to it that proper reforestation follows in the wake of heavy cuttings. If a private forest is maltreated, or if damaging natural phenomena, or the spread of damaging insects, are apt to be caused by the mismanagement of a given private forest, then these same authorities take measures to prevent bad effects from resulting to the general welfare of the country.

Under the forest policy law above mentioned, no forest must be converted into permanent farm land, unless the consent of the forest authorities is previously obtained. Permission is usually not denied if the soil in question is better adapted to farming than to forestry, provided that climatical damage is not apt to result from the change; and further, provided that adjoining forests are not endangered, notably by windfall as a consequence of deforestation to the windward. As a rule, only small portions of forest are converted into farm land; and since a large number of abandoned farms have been reforested in the last ten years, there has been witnessed an increase of the forest area and not a reduction.

It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general

As further showing the situation in Wurtemberg, I quote from the personal observations of Mr. Austin Cary, an American forester:

"The Black Forest is a region of high and rough land about a million acres in extent, partly in Baden and partly in Wurtemberg. It is well cut up with railroads and turnpikes; it has towns and villages scattered all through it, but much the greater portion of its area is covered with trees. The first forest of which I gained any knowledge was the property of the city of Freudenstadt, in Wurtemberg. I remember thinking as I rode up to the place by rail and found it a city of 6,000 inhabitants, that it wouldn't do for a man like myself, who wished to see nothing but woods from morning till night, to live in the city. I would get off into the woods themselves and live. How great was my mistake! The forest was all about us. In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in the whole state of Maine. Spruce and fir trees two to three feet through, and all the way up to 130 feet high, stood on the ground as thickly as they could stand. There were acres there that would cut more than 100,000 M. The previous summer I had cruised all through the spruce lands of the Kennebec, and here on single square miles was more timber than on whole townships on that river. And the best of it was this was no new or exceptional thing. The whole area of the forest was doing it. If it hadn't old timber it did have young, which is quite as essential to the result They were growing that timber right along because they knew how to do it and because they were patient enough to wait for results."

FREDERICK THE GREAT, THE FATHER OF GERMAN FORESTRY.

Frederick the Great promulgated laws in 1740 and 1754 for regulating the cutting of wood, which previously had been done as everyone pleased, without any regard to replanting. In place of such improvident practice he established rotations of 70 years; that is, he provided that forests should have 70 years in which to mature before being cut, also prescribed methods of thinning so that the young and healthy growth of oak and beech would be better protected. Later instructions were issued in 1764, 1770, 1780, 1783. In addition to this he instituted communal forests under the care of wardens, forbade private owners from every wasteful cutting and placed under the care of the state a portion of the forests in Silesia which previously had belonged to private parties. Frederick the Great ordered the division of the national forests into compartments or blocks, each of which was to acquire the age of 70 years before being cut. But inasmuch as it was found that 70 years were not sufficient for the proper growth of the trees, each of these main compartments were subdivided into two compartments, so that a period of growth running 140 years was established.

There had been, in more ancient times, laws relating to forests for certain parts of Prussia, the first dating 1547. These related to the right of using the forest and necessity of replanting, more than to general systematic care. One can therefore properly claim that Frederick the Great is the father of the German forests, as it was he who created the existing forestry laws and made them apply to private as well as to state forests.

SOME NOTICES OF THE PRESS DURING THE PAST TWELVE YEARS.

The principle on which the present work in Minnesota is based is that *prevention* of fires is the chief remedy. * * This report is one of the most valuable documents of its kind which has been published. * * It will be widely called for, and gives an object lesson to other parts of the country.—*Boston Herald* (1896).

The annual report of the Chief Fire Warden of Minnesota, Mr. C. C. Andrews, is a document of value to all interested in forestry. As Mr. Andrews says, when people understand the benefits to be derived from a rational management of our forest lands, then, and not till then, will there be a public sentiment that will make the Fire Warden Law as effective as it should be. The attempt which Minnesota is making to prevent forest and prairie fires is indeed a commendable one.—*Outlook* (N. Y.)

Very notable contribution to the literature of forestry.—*American Lumberman.*

Since the establishment of the office the state has been singularly free from destructive fires.—*Minneapolis Lumberman.*

Apart from the importance of the subject, the masterly way with which it is handled makes this report of 137 pages a gem of its kind. This compilation of data represents an immense amount of painstaking labor, on which an active mind and a strong hand has done first-class service.—*St. Louis Lumberman.*

The Fifth Annual Report of the Chief Fire Warden of Minnesota is not exactly a magazine, but it has illustrated pages, it deals with nature, and it is full of information about forests in this and other countries. Don't fail to get this report. It is exceedingly valuable. Here is a chance for the schools to become intelligent concerning our Minnesota forests and concerning forestry generally.—*School Education.*

A most interesting document. * * This movement is full of hope for the future of American forests.—*Chicago Standard.*

The public mind needs to be educated on the subject, and a report like this will have an excellent effect.—*Minneapolis Journal.*

State document of great value.—*Farm, Stock and Home.*

Gives evidence of able and energetic work on his part.—*Popular Science Monthly.*

This document gives a great deal of valuable information. * * The letters sent by the fire wardens and others throughout Minnesota to their Chief in reply to his circular of inquiries are remarkably intelligent and interesting.—*American Architect and Building News* (Boston).

We should like very much to see it duplicated in Wisconsin.—*Eau Claire Leader.*

Exhibits the fact that the Chief Fire Warden is in close touch with the fire wardens in each town in the state.—*Roseau Times.*

The Minnesota law is one of the best and most progressive in force in any of the states.—*Gifford Pinchot, Chief of the U. S. Division of Forestry.*

RESOLVED, As a fundamental proposition of rational forestry, we commend the well-organized effort of the State of Minnesota to suppress forest fires, being aware that no advance can be made in forest management without such protection.—*Resolution adopted by the American Forestry Association.*

Under the vigorous administration of the present Chief Fire Warden much has been done to promote the growth of a correct public sentiment and not a little has been accomplished in the actual prevention and suppression of fires.

Warning notices in great numbers have been posted and the intelligent cooperation of a large force of assistant wardens has been secured. During the drought in the early summer of the present year over 300 fire wardens were in correspondence with their chief, reporting precautions taken, and otherwise showing their interest and activity. The system is doubtless capable of improvement, but in its inception and reasonably successful working a great step has been taken, and by so much Minnesota is well in advance of Michigan and Wisconsin. —*Prof. V. M. Spalding of the University of Michigan, in "Science" for December 28, 1900.*

Minnesota is taking a foremost place among the commonwealths that are giving attention to forestry. The annual reports of General C. C. Andrews, really forestry reports, are of great interest and value.—*Democrat Chronicle*, Rochester, N. Y. (1901).

Preventing fires by careful watching and prompt punishment for law breaking hunters and campers, and also by quick action in stopping incipient fires are the chief means resorted to to protect the forests from conflagration. This sort of work Chief Fire Warden Andrews is doing in Minnesota to as great an extent as is possible with the means at his disposal to do with.—*Farm, Stock and Home*, Minneapolis (1906).

While it is never safe to speak too glowingly of a service that has been performed while there is yet danger of failure, it has undoubtedly been proven that the work of the department of the chief fire warden of Minnesota has been efficient during the years since it was created.—*Mississippi Valley Lumberman* (1906).

[From Gen. Henry L. Abbot, Colonel of Engineers, U. S. Army, retired, one of the commission appointed by the National Academy of Sciences to consider and report a forest policy for the United States and upon whose report the forest reserves were established.]

CAMBRIDGE, MASS., June 29, 1901.

Mr. C. C. Andrews, Chief Fire Warden, St. Paul, Minn. Dear Sir: Please accept my thanks for the copy of your annual report for the year 1900, which has come safely to hand. I need not say how much those who appreciate the value of our forests admire the good work you are doing for their proper treatment.

Yours truly, HENRY L. ABBOT.

For the twelfth time, Minnesota's Prophet of Forestry, Gen. C. C. Andrews, presents to the government and people of the State his annual report. For nearly thirteen years Gen. Andrews has given to the forestry interests of the State the most painstaking and conscientions study; to the protection of its forests against fire, in his capacity as chief fire warden, the most vigilant watch-care. * * *

But his service as fire warden, important as it has been, has not paralleled in magnitude that which he has sought to render in the capacity of a public teacher of the principles of forestry. By the conditions of the act creating his office, it was made a part of his duty to "disseminate information concerning forestry." That part of his commission he has interpreted in the terms of the enthusiast—more and more so as the mistakes and wastefulness of the State's policy toward its lumbering interests became clear to him, and he perceived the necessity of providing—in Minnesota, the traditional "home of the pine" and the storehouse of a forest wealth once deemed "inexhaustible"—against a treeless future. He has been indefatigable in traveling over the State as the herald and exponent of a rational forestry. In lectures before schools, colleges and societies; in frequent contributions to the newspapers; in conversation with individuals and in labors before legislative committees, he has presented such an array of facts and figures as should, as the result of his work, have made Minnesota foremost among all the States in its provisions for maintaining its forests and averting an impending lumber famine. His annual reports have been masterly in their presentation of the forest situation here as compared with that in Europe and in other States of our Union, and in their arguments, verbal and pictorial, for the substitution in Minnesota of a wealth-producing for a wealth destroying system.—*Pioneer Press*, St. Paul, Minn., Aug. 6, 1907.

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A forest nursery in Germany. If the proposed constitutional amendment for a tax of one-fifteenth of a mill on each dollar of taxable property (seven cents on a $1,000) for reforestation shall be adopted next November, we shall see similar forest nurseries in Minnesota belonging to the State.

FORESTRY

Walter Mulford 2

FIFTEENTH ANNUAL REPORT

OF THE

FORESTRY COMMISSIONER

(FORMERLY CHIEF FIRE WARDEN)

OF

MINNESOTA

AS REQUIRED BY CHAPTER 22 OF THE REVISED LAWS OF MINNESOTA, 1905.

FOR THE YEAR 1909

ST. PAUL, MINN.
PRINTED BY THE PIONEER COMPANY
1910

STATE OF MINNESOTA,
OFFICE OF FORESTRY COMMISSIONER,
ST. PAUL, JUNE 30, 1910.

Hon. S. G. Iverson, State Auditor:

SIR: As required by Section 3 of Chapter 22, Revised Laws of Minnesota, 1905, I have the honor to submit, herewith, my annual report for the year 1909.

Very respectfully,
C. C. ANDREWS,
Forestry Commissioner.

FIFTEENTH ANNUAL REPORT

OF THE

FORESTRY COMMISSIONER

OF MINNESOTA.

Very dry weather prevailed in the forest regions of Minnesota the month of May, 1909, and during the latter part of June and first part of July. There was a considerable fall of snow the 14th and 15th of November.

Town supervisors are by law fire wardens for their respective towns. At the March election every year there is some change of these officers. Just as soon after the election as possible the Forestry Commissioner obtains the address of all of them and then mails to them printed instructions, return envelopes and blanks on which every forest or prairie fire is to be reported. Wardens are paid twenty-five cents an hour and necessary expenses for their services when actually employed, and they are urged to be prompt and energetic in investigating and reporting every forest or prairie fire and to state the circumstances tending to show how it was caused in the absence of direct evidence. The number of reports received from wardens of forest fires was 154, showing that 45,690 acres, of mostly cut-over land, were burned over, with a total damage of $61,170. The number of people reported as fighting these fires was 1,458. A statement of the causes of the fires, so far as could be ascertained, follows the printed summary of the fires.

The number of prairie fires reported was 23, which burned over 19,170 acres. Damage $8,286. Number of persons reported as having fought these, 207.

SUMMARY OF FOREST FIRES, 1909.

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
Aitkin County—					
Clark	July 16	110	None	13	Lightning.
Davidson	July 18	8	$75	18	Burning brush.
Fleming	July 5	100	50	12	Campers.
Fleming	July 17	160	75	15	Campers.
Hebron	July 11	200	100	9	Unknown.
Hebron	Oct. 8	20	....	1	Unknown.
Jevne	July 2	200	175	8	R. R. locomotive.
Kimberly	July 7	40	50	22	Clearing R. of Way.
Kimberly	July 14	80	70	15	Unknown.
McGregor	Nov. 6	1,000	490	4	R. R. locomotive.
Nordland	July 15	80	None	3	Clearing land.
Spencer	May 23	80	....	3	Clearing land.
Spencer	June 28	6	30	4	R. R. locomotive.
Becker County—					
Two Inlets	July 7	6	7	9	Unknown.
Beltrami County—					
Battle	June 22	10	70	11	Clearing land.
Bemidji	June 15	120	120	7	R. R. locomotive.
Bemidji	July 5	10	16	15	Fire crackers.
Blackduck	May 23	12	....	......	Clearing land.
Eckels	June 4	300	50	6	Unknown.
Eckels	July 6	160	....	......	R. R. locomotive.
Eland	June 25	80	None	5	Unknown.
Frohn	July 8	640	200	21	Unknown.
Grant Valley	May 22	30	25	5	R. R. locomotive.
Grant Valley	May 25	15	100	3	R. R. locomotive.
Grant Valley	June 20	1,200	1,000	59	Unknown.
Maple Ridge	May 26	1,000	....	18	Burning brush.
Moose Lake	July 4	50	....	6	Unknown.
Northern	May 27	300	400	16	Clearing land.
Northern	May 27	320	200	11	R. R. locomotive.
Northern	June 11	200	500	12	Unknown.
Nymore (Village)	June 15	50	Slight	20	Burning brush.
Summit	May 26	240	2,000	12	Unknown.
Summit	July 11	40	500	5	R. R. locomotive.
Taylor	May 25	5	None	5	Fishermen.
Taylor	June 14	30	40	......	....
Taylor	July 5	120	200	4	Unknown.
Turtle Lake	May 26	40	100	10	Clearing land.
Turtle Lake	Oct. 8	40	....	4	Unknown.
Turtle River	June 18	100	None	10	Burning brush.
Turtle River	July 7	60	Slight	2	From adjoining town
Township 151-30	May 26	40	56	4	R. R. locomotive.
Carlton County—					
Thomson	July 17	8	375	10	Incendiary.

SUMMARY OF FOREST FIRES, 1909—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Cass County—					
Gould	May 26	40	100	4	Unknown.
Gould	Oct. 9	1	None	6	Burning R. of Way.
Moose Lake	Nov. 1	5	None	2	Unknown.
Ponto Lake	May 25	1,000	Slight	6	Unknown.
Powers	May 25	1,000	1,000	44	From saw dust pile
Powers	May 25	80	....	10	Unknown.
Wabedo	May 25	100	Slight	2	Unknown.
Township 145-31	May 20	240	Slight	......	Burning meadow.
Township 145-31	June 18	200	200	12	Unknown.
Clearwater County—					
Dudley	July 6	40	100	1	Unknown.
Cook County—					
Colville	May 26	15	75	4	Unknown.
Grand Marais	May 25	40	500	12	Unknown.
Lutsen	June 7	400	300	40	Burning brush.
Rosebush	May 26	......	....	......	Clearing land.
Rosebush	June 26	1,000	800	12	Burning brush.
Rosebush	June 29	5	None	12	Clearing land.
Schroeder	May 31	3,000	200	50	Unknown.
Crow Wing County—					
Baxter	May 28	500	200	......	Clearing land.
Bay Lake	April 20	100	50	12	Unknown.
Emily	June 25	800	500	13	Unknown.
Klondike	July 10	900	500	8	Unknown.
Hubbard County—					
Farden	May 23	600	100	None	Burning brush.
Farden	June 20	180	....	12	R. R. locomotive.
Hendrickson	May 25	1,500	500	12	Unknown.
Hendrickson	May 27	100	50	2	Unknown.
Hendrickson	May 28	200	None	2	Unknown.
Hendrickson	July 9	25	None	1	Unknown.
Henrietta	May 27	200	100	12	Unknown.
Mantrap	May 11	400	150	4	Burning brush.
White Oak	July 7	100	Light	24	Unknown.
Township 141-36	May 29	320	Slight	8	Unknown.
Township 143-36	Oct. 7	38	200	12	Burning brush.
Itasca County—					
Ardenhurst	July 6	1	None	5	Blasting stumps.
Bass Lake	May 24	3,000	Slight	None	Unknown.
Bearville	May 25	2,000	3,000	None	Camp fire.
Bearville	June 8	600	300	6	Unknown.
Bearville	June 28	2,400	5,500	15	Unknown.
Bigfork	May 26	100	200	6	Burning brush.
Bigfork	May 26	400	1,200	8	....
Blackberry	Sept. 25	5	Slight	20	R. R. locomotive.

SUMMARY OF FOREST FIRES, 1909—Continued.

County and Town	Date	Acres	Damage	No. Fire Fight-ers	Cause
Itasca County—*Cont.*					
Deer River........	July 8	6	Slight	7	R. R. locomotive.
Feeley............	May 25	800	6,000	14	From adjoin'g town.
Goodland..........	May 21	200	Slight	17	R. R. locomotive.
Goodland..........	May 25	100	Slight	13	R. R. locomotive.
Lake Jessie........	May 26	440	500	12	Unknown.
Lake Jessie........	May 28	30	Slight	1	Unknown.
Lake Jessie........	June 4	40	None	5	Unknown.
Lake Jessie........	June 11	40	200	4	Unknown.
Lake Jessie........	June 11	20	None	4	Unknown.
Lake Jessie........	July 5	370	400	13	R. R. locomotive.
Lake Jessie........	July 6	40	50	8	Unknown.
Lake Jessie........	July 7	330	500	13	R. R. locomotive.
Marcell............	July 9	1,200	700	10	Unknown.
Nore...............	July 7	640	300	15	Unknown.
Nore...............	July 11	200	800	19	Unknown.
Sand Lake.........	July 6	80	None	8	Unknown.
Sand Lake.........	July 8	400	400	2	Unknown.
Third River........	May 25	300	5,000	8	Burning brush.
Koochiching County–					
Evergreen.........	May 28	200	100	None	Unknown.
Evergreen.........	July 3	10	40	7	Unknown.
Ray...............	July 10	3	Slight	1	Campers.
Roosevelt (Village).	May 8	5	500	10	Mill engine furnace.
Roosevelt (Village).	May 28	10	Slight	13	Unknown.
Lake County—					
Beaver Bay........	June 15	320	None	30	Burning brush.
Crystal Bay........	May 25	90	Slight	4	Camp fire.
Two Harbors......	May 24	160	500	None	Burning brush.
Two Harbors......	July 9	40	50	18	Burning brush.
Mille Lacs County—					
Isle Harbor........	Oct. 7	20	30	None	R. R. locomotive.
Milaca............	Oct. 29	200	Slight	3	Hunters.
Morrison County—					
Platte.............	July 18	200	600	4	Campers.
Ripley............	April 14	1,200	500	7	Unknown.
Ripley............	May 23	701	700	3	From adjoin'g town.
Ripley............	Aug. 20	1	50	2	Unknown.
Rosing............	Oct. 3	500	None	3	Hunters.
Pine County—					
Kettle River...	July 16	15	60	4	R. R. locomotive.
Norman...........	May 27	80	Slight	5	Unknown.
Windemere........	May 19	200	600	4	Burning brush.
Roseau County—					
Malung............	May 4	600	100	2	Hunter.
Township 161-35...	June 24	10	Slight	None	Unknown.

SUMMARY OF FOREST FIRES, 1909—Continued.

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
St. Louis County—					
Buyck	July 1	80	2,500	14	Unknown.
Cotton	May 25	10	100	8	Unknown.
Culver	May 25	200	275	15	R. R. locomotive.
Culver	July 9	40	50	11	Clearing land.
Embarras	May 24	200	400	15	R. R. locomotive.
Embarras	May 27	360	1,000	15	R. R. locomotive.
Embarras	May 28	40	100	9	Unknown.
Fayal	May 30	1	400	5	Unknown.
Fern	May 25	3,000	10,000	9	Burning brush.
Fredenberg	July 10	1	10	3	Unknown.
Great Scott	July 6	100	Light	2	Unknown.
Industrial	July 4	2	None	6	Clearing land.
Kelsey	May 26	240	Slight	30	Unknown.
Kelsey	July 8	40	40	9	Unknown.
Kelsey	July 9	640	500	6	R. R. locomotive.
Kugler	May 26	400	300	2	Unknown.
Kugler	July 4	3	5	8	Unknown.
Kugler	July 8	40	125	7	R. R. locomotive.
Levall	May 26	100	50	5	Unknown.
Levall	June 4	120	60	6	Unknown.
Meadow Lands	July 7	50	100	3	R. R. locomotive.
Mesaba	June 2	80	100	......	R. R. locomotive.
Pike	May 26	260	100	17	Unknown.
Proctor Knott	July 9	6	Slight	18	Unknown.
Rice Lake	May 25	40	Slight	10	Unknown.
Solway	June 10	2	50	4	Clearing land.
Solway	July 9	80	Slight	7	R. R. locomotive.
White	May 23	180	1,000	26	Unknown.
White	May 26	260	800	30	Unknown.
Wuori	May 28	300	200	15	Unknown.
Township 61-16	May 26	260	800	21	R. R. locomotive.
Wadena County—					
Huntersville	May 23	120	Slight	5	Unknown.
Huntersville	July 17	600	Slight	22	Unknown.
Orton	July 18	80	80	6	Unknown.

Total acres burned over, 45,690.

Damage, $61,170.

Number of fire fighters, 1,458.

Classification of causes:

- Burning brush, 17.
- Campers, 5.
- Clearing land, 13.
- Hunters, 4.
- Railroad locomotives, 27.
- Other causes, 10.
- Unknown, 73.

SUMMARY OF PRAIRIE FIRES, 1909.

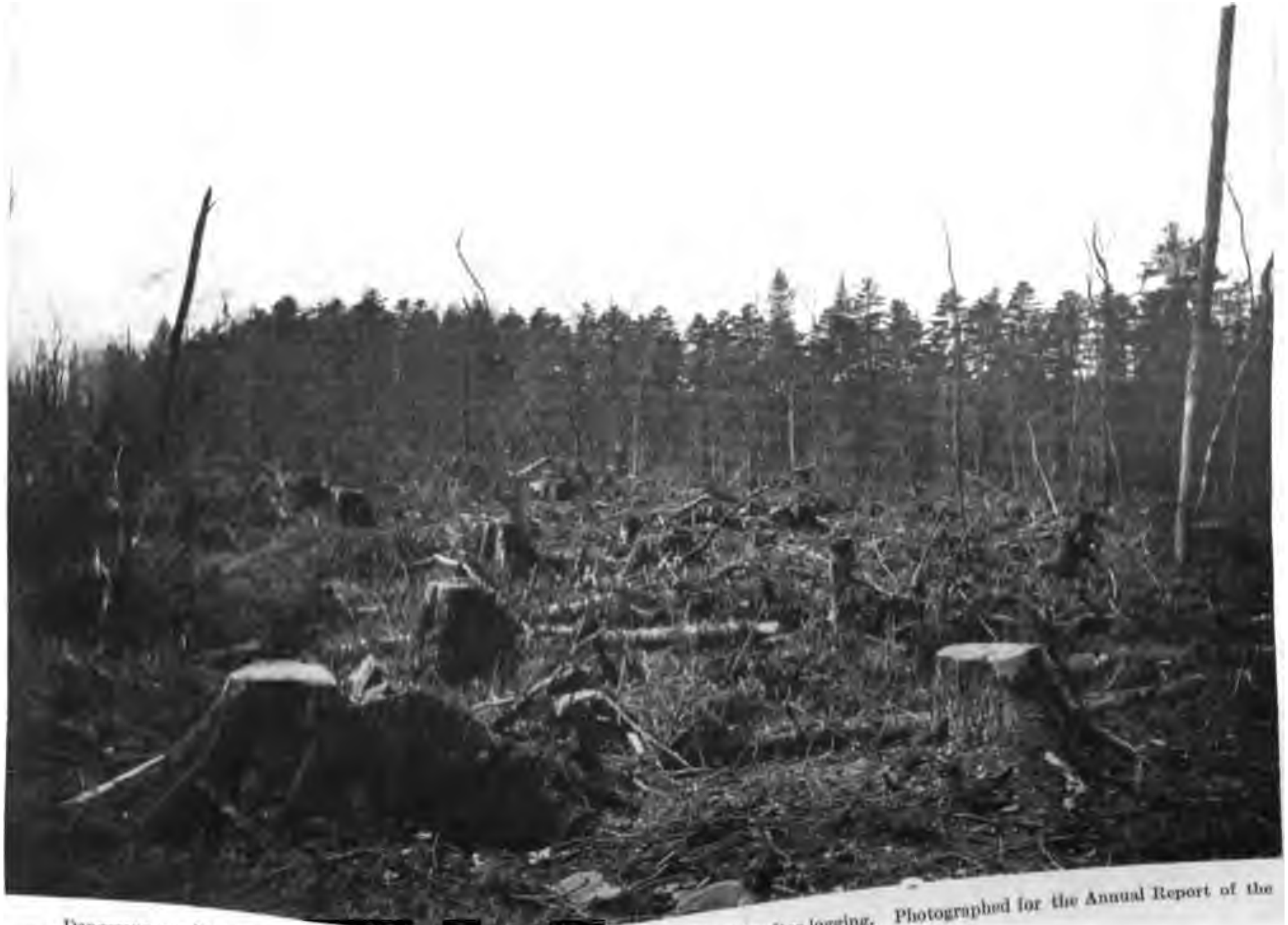
COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
Clay County—					
Hagen	Sept. 10	30	$50	6	Hunters.
Highland Grove	Oct. 31	20	20	1	R. R. locomotive.
Highland Grove	Nov. 6	25	126	9	R. R. locomotive
Kittson County—					
Arveson	May 26	400	300	......	Unknown.
Deerwood	May 10	400	None	6	Unknown.
Deerwood	Nov. 9	300	100	15	Unknown.
Norway	May 10	2,000	Slight	6	Unknown.
Marshall County—					
Augsburg	Nov. 10	500	50	10	Unknown.
Eckoll	Nov. 5	500	None	......	Burning meadow.
West Valley	May 10	160	200	2	Unknown.
Norman County—					
Lockhart	April 26	500	....	......	Unknown.
Rockwell	May 9	5	10	5	Unknown.
Spring Creek	April 26	1,000	1,500	22	Unknown.
Winchester	Oct. 28	300	200	4	Unknown.
Ottertail County—					
Western	Oct. 7	2,000	2,000	50	Threshing machine.
Polk County—					
Fanny	Oct. 19	500	2,000	15	Burning straw pile.
Helgeland	April 17	3,000	400	2	Unknown.
Onstad	Oct. 6	300	110	7	R. R. locomotive.
Onstad	Nov. 6	1,200	400	16	Hunters.
Parnell	Nov. 6	3,000	500	16	Unknown.
Roseau County—					
Soler	May 4	400	120	1	Unknown.
Soler	Oct. 5	200	None	8	Unknown.
Wilkin County—					
Neilson	May 9	2,240	200	6	Burning grass.

Total acres burned over, 19,170.
Damage, $8,286.
Number of fire fighters, 207.
Classification of causes:
- Burning grass or straw, 2
- Hunters, 2.
- Railroad locomotives, 3.
- Unknown, 12.

BURNING SLASHINGS.

The law for the piling and burning of slashings, which went into effect April 13, 1909, is as follows:

Any person or corporation who cuts or fells or causes to be cut and felled timber or wood or trees of any kind for commercial purposes shall pile, and under charge of a competent person or persons burn the slashings (by which is meant the branches, tops and refuse). Said burning shall be done as soon as practicable, at a time when it can be done without danger and before the first day of May next following. It shall be the strict duty of each fire warden, under the orders of the commissioner, to see that the provisions of this section are faithfully complied with. Any person or corporation who cuts or fells trees or bushes in clearing land for roadbed or right of way for any railroad, highway or trail, shall in the same manner pile and burn the slashings, and all combustible material except fuel and merchantable timber. In every above instance of piling and burning, care in proportion to the danger shall be exercised to prevent injury to remaining standing timber or woods. Any person or corporation who cuts or fells trees or bushes in clearing land for agricultural or pasturage purposes is prohibited from setting fire to the slashings, brush, roots or excavated stumps or other combustible material on such land before having piled the same. Every owner or occupant of land is prohibited from setting fire to any such slashings, brush, roots, stumps (whether excavated or otherwise), or other combustible material in a dry season, and is prohibited from using fire or allowing fire to be burning or smouldering on such land in any such season. Any person or corporation who violates any of the foregoing provisions of this and the three preceding sections shall be deemed guilty of a misdemeanor, and, on conviction thereof, be punished for each offence by fine not less than fifty dollars nor more than one hundred dollars and costs of prosecution, or imprisonment in the county jail not less than thirty days nor more than ninety days. The person other than the forestry commissioner upon whose complaint a conviction is had for violation of any of the provisions of this chapter shall be entitled to one-half the fine recovered upon sentence therefor.



Dangerous condition in respect to fires in which the country is frequently left after logging. Photographed for the Annual Report of the Forestry Commissioner.

HOW THE SLASHINGS LAW HAS BEEN COMPLIED WITH.

I cannot say that this law has been well complied with. I am not quite sure that I can say that it has been generally complied with. It has, however, been complied with in good faith by very many people; and considering that it was the first year of its trial, perhaps its observance has been as general and satisfactory as could be expected.

On the 16th of December, temperature at zero, I witnessed the burning of Norway pine slashings, about three miles south-west of the village of Cass Lake, by employes of Mr. John Goss, an experienced lumberman. The fires were started with a few dry kindlings on which a little kerosene had been poured. There was a foot of snow on the ground. The slashings had been cut some days previously. It required attention and activity to keep the fires going, but there was no question that the burning was successful and practicable.

January 6th I again witnessed the burning of pine slashings near the camps of the Cloquet Lumber Company, forty miles north of Duluth, and was accompanied by some of the principal men of that company. The slashings had been previously piled and in a few instances where a pile had been set on fire, the fire went out before the pile was half burned. In other cases where a really hot fire was under way and the flames were rising ten feet or more and slashings were continually being laid on, they were quickly consumed and the burning was successful.

February 9th I visited some of the camps of the Virginia and Rainy Lake Company, between Pelican and Ash Lakes, St. Louis county; Superintendent Gillmor accompanied me. Most of the slashings had been piled.

Attempt was made to burn several piles, but with not as good success as at the camps previously mentioned.

As a result of my personal observations, I issued new instructions to wardens not to prosecute persons who were failing to burn their slashings if they had good reason to believe that the parties really intended to burn them before the first of May.

BURN WHEN FIRST CUT.

From all I have seen and learned I am of the opinion that the cheapest and best time to burn slashings is immediately after the trees are felled. Many examples have shown that pine tops and branches then burn readily. A good fire should first be kindled and the branches laid upon it. There is seldom any danger in the winter, but if the burning is postponed till late in the spring or summer, there is great danger of the fire getting beyond control and doing damage.

RETURNS OF SLASHINGS BURNING.

In January I sent a blank entitled, "Fire Warden's Report on Slashings," such as below printed in reduced form, on which wardens were required to report the names and addresses of persons cutting timber or wood in their respective districts for commercial purposes; what proportion of slashings had been piled and burned; the conditions for burning; whether conditions for burning were unfavorable, etc. Up to April 26th, 257 reports on these blanks had been received from fire wardens, showing that in the aggregate 689 persons or companies were cutting timber or wood for commercial purposes; that 412 were burning or intending to burn before May 1st.

FIRE WARDEN'S REPORT ON SLASHINGS.

County of... P. O and Date...
Town of .... Name of Warden ....

Name of person or company cutting timber or wood for commercial purposes. If company, give its name and name and P. O. of its manager or superintendent	Name of town No. of township	Range	Section or Sections	Number of acres roughly estimated being cut over. Give estimate of number feet cut if convenient	Prevailing kind of timber or wood	About what proportion of slashings have been piled?	About what proportion of slashings have been burned, and on what section?	If slashings are not being burned, are there good reasons for believing they will be before May 1st?	If conditions for burning are exceptionally unfavorable explain them	Is this report for just your district or for the whole town?	State any other facts, and whether the party shows willingness to comply with the law. Also mention any neighboring unorganised township in which slashings are being made

OFFICE OF FORESTRY COMMISSIONER,
ST. PAUL, Jan. 27, 1910.

New settlers do not want to take their families into a region surrounded by slashings. The burning of slashings will promote the settlement of vacant lands. If slashings are left unburned, they are liable to cause forest fires, in which case innocent people are taxed to pay for fighting fires. Under the common law, where slashings endanger the property of another, they are a "nuisance," and the owner of the land can by civil action be required to remove them. If slashings exist to such extent as to endanger the safety of many people, they are a "public nuisance," and the owner of the land on which they are situated can be proceeded against civilly and criminally. That has always been the law. Abundant examples show that under ordinary circumstances slashings can be successfully burned as the cutting progresses in winter. It needs some dry kindling to start a fire. If, however, conditions are very unfavorable, and wardens have very good reasons to believe that the burning will be done in good faith before May first, they need not insist on immediate burning. After the first of May each warden in whose district slashings have been made will make a separate report to the Forestry Commissioner, giving the address of any party in his district who has failed to burn slashings, and will state the subdivisions, town and range on which the slashings are situated and about their extent.

Wardens ought in many cases to be able to furnish the facts called for on this blank from information they already have, and without incurring expense of special visit and investigation. They can charge a reasonable amount for making this report. It should be made promptly.

C. C. ANDREWS, Forestry Commissioner.

The opinion has been advanced by some experienced lumbermen that it would be an improvement to change the law so as to permit the burning of the slashings any time before July; and for the reason that the green vegetation by that time would lessen the danger of fire spreading. But if the burning is postponed until summer, very few men will be left in camp to control a fire. One instance is known where a company that had cut an extensive area let the job of burning the brush to a man for $200. The brush had not been piled and he set the fire in dry weather and was unable to control it. It did not sufficiently burn the brush, yet spread and did damage to others.

It must not be expected that the burning of slashings will have been done to entire satisfaction the first logging season the law was in force. There will be some cases where it will not be practicable to burn without endangering other timber. People who manifest a purpose to comply with the law in good faith, should have no trouble with the state authorities.

The following letter from a fire warden in the Town of Hovland, Cook County, shows what can be done when people in good faith try to comply with the law, and where wardens are zealous in the discharge of their duties:

HOVLAND, MINN., May 18, 1910.

GEN. C. C. ANDREWS,
Forestry Commissioner,
St. Paul, Minn.

Dear Sir: I would respectfully make the following report. Last year the fire wardens of our town of Hovland posted the fire warning notices you sent for the purpose where we thought they would do most good, and since last January we notified *each* of the logging companies and individuals cutting timber in the town regarding the "slashings" law, and most of whom have been quite reasonable in regard to the matter. The burning of slashings this spring has been somewhat handicapped by reason of the scarcity of snow last winter, preventing the getting out of all of the cut timber, a considerable portion of it still being in the woods in some cases.

The Pigeon River Lumber Company has the largest holdings of any logging concern doing business in the town (up along the Canadian boundary), and a letter received from Mr. D. J. Arpin, president of that company, (some time ago), indicates a disposition to co-operate with us in the matter, and we have been advised that they had a crew of men at work burning the slashings. Our Town Board had the brush piled along the new town roads cut out last year, and successfully burned early in April, when there was no danger. Last week there was small smoke visible to the north on the Canadian side of the boundary, and we sent one of our fire wardens, accompanied by our town constable, to investigate and ascertain if there was danger of the fire crossing the line (river) into our territory, necessitating the patrolling of the same, and they report that while the fire was *near* the line in places, it had not yet crossed the Pigeon River, into our town, though much damage is reported to have been done on the other side of the river. Should the fire come to the river, a dozen men at the right time *stationed along the river, would do more good in preventing* it starting on this side, than a hundred men could possibly do in stopping it after it had once got into the cedar and spruce swamps.

Fortunately, we had quite a heavy *rain* yesterday, which has helped matters greatly. We have had no fire in the town this year as yet that got beyond control or that did any damage, and we trust there will be none. Please send more return envelopes, verified account blanks, and oblige,

Very truly yours,
N. J. BRAY,
Chairman Town Board.

THOROUGHGOING DISPOSAL OF SLASHINGS.

In the legislature of 1903 a bill was introduced which I had carefully drawn, with good legal assistance, providing that when people failed to burn their slashings the state could do it, and the expense be a lien on the logs and land of the party who left the slashings. The following is the provision thus introduced seven years ago:

> "From and after the passage of this act, any person who shall cut, or cause to be cut, any logs, railroad cross ties, cedar poles or other timber on any land situated in this state, shall, before the first day of April next ensuing, burn or remove the tops and refuse. Care shall be used so as not to damage standing timber and adjoining property. In case of failure to do this, then the Chief Fire Warden may cause the same to be done and the reasonable expense thereof shall be a lien on the logs, railroad cross ties, cedar poles or other timber cut on the land where the tops and refuse were situated or cut, and shall also be a lien upon the land where such tops and refuse were situated or cut. Proceedings for the enforcement of such lien shall be instituted by the county attorney at the request of the Attorney General, pursuant to the provisions of Chapter 342 of the General Laws of Minnesota for 1899, but in the name of the State of Minnesota as claimant, so far as the same can be applicable; and costs shall be recovered as prescribed in said chapter. The claim for any lien may be filed by the Chief Fire Warden, or, under his direction, by a fire warden of the town in which the expense occurred, in the office of the Clerk of the District Court, in the county in which the claim arose."

There was so much opposition to this proposed enactment on the part of lumbermen that it was withdrawn. If the milder law now in force shall not be complied with in good faith by the great majority of people who cut timber and wood to sell, then the legislature will probably enact a more effective law.

WHEN SLASHINGS ARE A NUISANCE.

Under the common law, which is just as binding upon courts of justice as statute law, where slashings endanger the property of another they are a "nuisance," and the owner of the land they are on can by civil action be required to remove them. If slashings exist to such extent as to endanger the safety of many people, they are a "public nuisance," and the owner of the land on which they are situated can be proceeded against both by civil and criminal process.

INSTRUCTIONS TO WARDENS IN REGARD TO BURNING SLASHINGS.

For the purpose of instructing local wardens as to their duties in requiring observance of the slashings law and to stimulate their zeal in making the law respected in their respective towns, printed copies of the following circulars were mailed to them:

INSTRUCTIONS AND FORMS OF COMPLAINT ON PILING AND BURNING SLASHINGS.

Circular
No. 38.

State of Minnesota,
Office of Forestry Commissioner.
St. Paul, Minn., Nov. 11, 1909.

It is the duty of wardens to enforce the law for burning slashings without stopping to ask the opinion of the Forestry Commissioner. If they have evidence of the violation of the law, the proper thing to do is to go before some intelligent justice of the peace and make complaint. If they have reason to think the prosecution will be more prompt and effective by first communicating the facts to the county attorney, they can do so. In either case they should immediately inform the Forestry Commissioner of what has been done.

People who make slashings must pile and burn them **as their work progresses, and not let them accumulate.** In the Minnesota National Forest at Cass Lake, slashings are successfully piled and burned when snow is on the ground. They are not to be burned in a "dry season," nor in dry and windy weather. It is not expected they will be burned during a rain or snow storm, but under ordinary circumstances there should not be delay of more than a week. It is not expected that every particle of the slashings will be consumed to ashes, but that enough be burned to prevent future danger. The burning must be done in a common-sense and honest manner.

It will be for the public good if courts will impose the maximum penalty.

Wardens will have the law strictly enforced even if it requires a prosecution of the same party every week. If wardens fail in this duty they will be liable to prosecution themselves.

Below is printed the law in regard to slashings and some forms of complaint.

C. C. Andrews,
Forestry Commissioner.

LAW ON PILING AND BURNING SLASHINGS.

The following is an extract from Chapter 182, Session Laws of Minnesota, 1909:

1787d. Any person or corporation who cuts or fells or causes to be cut and felled timber or wood or trees of any kind for commercial purposes shall pile, and under charge of a competent person or persons burn the slashings (by which is meant the branches, tops and refuse). Said burning shall be done as soon as practicable at a time when it can be done without danger and before the first day of May next following. It shall be the strict duty of each fire warden, under the orders of the commissioner, to see that the provisions of this section are faithfully complied with. Any person or corporation who cuts or fells trees or bushes in clearing land for roadbed or right of way for any railroad, highway or trail, shall in the same manner pile and burn the slashings, and all combustible material except fuel and merchantable timber. In every above instance of piling and burning, care in proportion to the danger shall be exercised to prevent injury to remaining standing timber or woods. Any person or corporation who cuts or fells trees or bushes in clearing land for agricultural or pasturage purposes is prohibited from setting fire to the slashings, brush, roots or excavated stumps or other combustible material on such land before having piled the same. Every owner or occupant of land is prohibited from setting fire to any such slashings, brush, roots, stumps (whether excavated or otherwise), or other combustible material in a dry season, and is prohibited from using fire or allowing fire to be burning or smouldering on such land in any such season. Any person or corporation who violates any of the foregoing provisions of this and the three preceding sections shall be deemed guilty of a misdemeanor, and, on conviction thereof, be punished for each offence by fine not less than fifty dollars nor more than one hundred dollars and costs of prosecution, or imprisonment in the county jail not less than thirty days nor more than ninety days. The person other than the forestry commissioner upon whose complaint a conviction is had for violation of any of the provisions of this chapter shall be entitled to one-half the fine recovered upon sentence therefor.

FORM OF COMPLAINT WHERE SLASHINGS ARE MADE WHEN TIMBER OR WOOD IS CUT TO SELL OR HAS BEEN SOLD.

The law does not apply to a person who cuts for his own use. Proof of admission or of circumstances will show whether the timber or wood is cut to be sold. The law does not require proof of absolute certainty. It simply requires that a fact be proved beyond reasonable doubt.

State of Minnesota, } ss.
County of................ }

....being first duly sworn, makes complaint and says:

That..did on the........................ day of..............................A. D. 19......, at the town of....................... in said County and State, cut (if he caused the cutting, so state) timber (if trees for wood, so state) for commercial purposes and failed to pile and under charge of a competent person or persons to burn the slashings therefrom, contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said.......................... may be arrested and dealt with according to law.

....

Subscribed and sworn to before me this..........................day of ....A. D. 19........ ....

Justice of the Peace.

FORM OF COMPLAINT WHERE SLASHINGS ARE MADE IN CLEARING LAND FOR ROADBED, RIGHT OF WAY OR TRAIL.

STATE OF MINNESOTA, }
} ss.
COUNTY OF............... }

...., being first duly sworn, makes complaint and says:

That..., did on the........................ day of.............................., A. D. 19........, at the town of.................. in said County and State, cut (or fell) trees (or bushes) in clearing land for roadbed for a railroad (if on right of way or for highway or trail, so state) and did fail to pile the slashings and other combustible material, excepting fuel and merchantable timber, and burn the same under the charge of a competent person or persons, contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said..may be arrested and dealt with according to law.

....

Subscribed and sworn to before me this............................day of ....A. D. 19.........

....

Justice of the Peace.

FORM OF COMPLAINT WHERE SLASHINGS ARE BURNED BEFORE PILING THE SAME.

STATE OF MINNESOTA, }
} ss.
COUNTY OF............... }

...., being first duly sworn, makes complaint and says:

That...did on the........................... day of.........................., A. D. 19......, at the town of........................ in said County and State, cut (or fell) trees (or bushes) in clearing land for agricultural (or pasturage, if such was the fact) purposes and did set fire to the slashings (if brush, roots or excavated stumps or other combustible material, so state) on such land before having piled the same, contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said.................................... may be arrested and dealt with according to law.

....

Subscribed and sworn to before me this......................................
day of.......................................A. D. 19........

....

Justice of the Peace.

Note—That the burning of slashings as the work progresses is practicable has been demonstrated in the United States forest reserves as shown by the regulations printed below:

DEPARTMENT OF THE INTERIOR.

OFFICE OF SUPERINTENDENT OF LOGGING.

Cass Lake, Minn., Sept. 25, 1908.

To the Purchasers of Timber on Ceded Chippewa Indian Lands in Minnesota (Other than National Forest Lands): * * *

On and after the first day of October, 1908, all brush shall be burned at the time of cutting, excepting that cut during the months of April, May, June, July, August, September and October, which shall be piled at the time of cutting, and burned at that time if the weather and conditions permit, and if not, at such time as it shall be safe to do the burning without danger of forest fires. The Superintendent of Logging or his Assistant Superintendents are to be consulted as to the proper time, and the work done under their direction.

I would refer those purchasers who have done no burning in the winter to Goss & Sons, Cass Lake, Minnesota, Joseph Gibson Company, Deer River, Minnesota, Sam Simpson, Bena, Minnesota, and George Cochran, of Cass Lake, all of whom have been logging on ceded lands for the past four years, and burning their brush at the time of cutting, with profit to themselves, and at the same time have destroyed a very small percentage of green standing timber.

The Gibson Company and Mr. Simpson tried piling in the winter and burning in the summer the past logging season, and will return this winter to the former method of burning as they cut, having found it the most satisfactory way. Respectfully,

Approved November 2, 1908.
Wm. O'Neil,
Superintendent of Logging.

Fred Dennett,
Commissioner of the General Land Office.

Frank Pierce,
First Assistant Secretary of the Interior.

SLASHINGS.

Supplement to Circular 38.

State of Minnesota,
Office of Forestry Commissioner.
St. Paul, Minn., Feb. 1, 1910.

The opinion of the legal department of the State as to the duty of people who cut timber and wood for commercial purposes to burn their slashings before May first is hereby published for the information of all concerned:

Office of the Attorney General.
St. Paul, January 27, 1910.

General C. C. Andrews,
Forestry Commissioner,
Capitol.

Dear Sir:

This department is in receipt of your recent communications asking for certain interpretations of Chapter 182, G. L. 1909, and replying thereto I have to advise you that in our opinion a complaint for failure to properly burn slashings should affirmatively state that prior to the date of the complaint it had been practicable to so burn such slashings, and that the same could have been done without danger. Slashings must be burned in any event before May first in each year, and should be so burned at the first time such burning is practicable and can be done without danger. It is not permissible to wait until May first providing the conditions as to practicability and absence of danger occur prior to that time.

If enforcement of this law is delayed until May first, providing conditions warrant the slashings being burned before, there is serious danger of the law being evaded on account of removal of the persons offending from the scene of the cutting or from the jurisdiction of the courts.

Confirming the oral opinion given you heretofore, I have to state that the terms of the act in question apply equally to the owner of the timber who causes the same to be cut and the person who actually does the cutting, meaning by this that it is incumbent upon the person actually doing the cutting and felling of trees, and the person, if any, who causes such cutting and felling to be done, to see that the slashings are properly burned.

Your inquiry relative to the omission of the words "wilfully, wrongfully and unlawfully," is receiving attention, and on tomorrow suggestions as to form of complaint will be transmitted to your department.

Yours truly,

CLIFFORD L. HILTON,
Assistant Attorney General.

Where conditions for burning slashings are very unfavorable and wardens have good reason to believe that the party really intends to burn them before May first, they need not insist on immediate burning. But if wardens have reason to believe that a party does not so intend, and it can be proved (it is best to have in such case two good witnesses) that it was practicable to burn and he failed to do so, a prosecution should be instituted. Of course, wardens should not bring a case before a justice of the peace who is not in sympathy with the law. One or two convictions, with the maximum fine, will tend to make the law respected.

New settlers do not want to take their families into a region surrounded by slashings. The burning of slashings will promote the settlement of vacant lands. If slashings are left unburned they are liable to cause forest fires, in which case innocent people are taxed to pay for fighting the fires. Under the common law, where slashings endanger the property of another, they are a "nuisance," and the owner of the land can by civil action be required to remove them. If slashings exist to such extent as to endanger the safety of many people they are a "public nuisance," and the owner of the land on which they are situated can be proceeded against civilly and criminally. Abundant examples show that under ordinary circumstances slashings can be successfully burned as cutting progresses in winter. It needs some dry kindling to start a fire.

A form of complaint approved by the Attorney General's department is hereto attached.

C. C. ANDREWS,
Forestry Commissioner.

FORM OF COMPLAINT FOR FAILING TO BURN SLASHINGS.

STATE OF MINNESOTA, }
COUNTY OF................ }

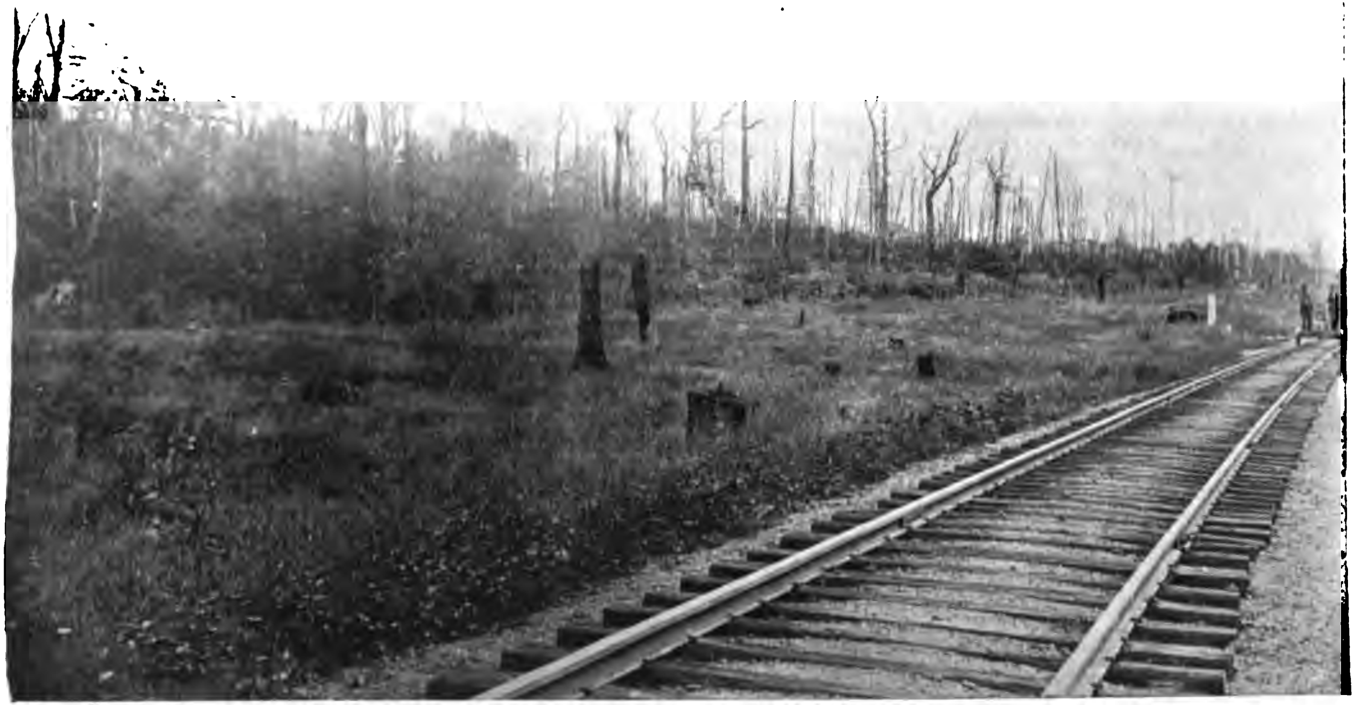
...., being first duly sworn and examined, on his oath says:

That..on the............................day of ....A. D. 19......, at the town of.................................. in said County and State, cut (if he caused the cutting, so state) timber (if trees for wood, so state) for commercial purposes, and failed to pile and under charge of a competent person or persons to burn the slashings therefrom, although it had been practicable to burn the same prior to the said date, and there had been prior to said date times when such burning could have been done without danger, contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said..may be arrested and dealt with according to law.

Subscribed and sworn to before me this...........................day of ....A. D. 19.........

....
Justice of the Peace.

Approved:
LYNDON A. SMITH,
Assistant Attorney General,
January 29, 1910.



Forest scenery along a railroad in Minnesota, ruined by fire set by locomotives. Green and growing forest along a railroad makes the country look attractive; but it is not too much to say that hundreds of miles of beautiful forest scenery along passenger and logging railroads in Minnesota have been destroyed by fire set by sparks from their locomotive engines. Such fires, with proper care, could be prevented. The legislature has not provided means to make the railroad companies obey the forest fire laws. Photographed for the Annual Report of the Forestry Commissioner of Minnesota.

INSTRUCTIONS ISSUED BY LOGGING COMPANIES.

As showing the kind of instructions that were issued by some logging companies to their employes, the following is printed:

THE VIRGINIA AND RAINY LAKE COMPANY.

C. C. Andrews, Cusson, Minn., March 10, 1910.
Forestry Commissioner,
St. Paul, Minn.

Dear Sir:

The following is a copy of instructions issued relative to the burning of brush on our operations:

Mr. Robt. Bartley, Asst. Supt.,
Cusson, Minn.

Dear Sir:

Kindly instruct all your foremen to issue instructions to all their under-bosses to see that every swamper piles the underbrush as much as possible, and sometime in April, and without fail before May 1st, to burn same, and also instruct them, in setting fires, to use all necessary precaution in selecting a day when wind is blowing in opposite direction from any heavy standing timber or railroad tracks.

These instructions are very important and must be lived up to to conform with the state law.

Kindly acknowledge receipt of this letter, stating at what date you have issued orders. Yours truly,

F. H. Gillmor, Supt.

PATROL OF RAILROADS.

Every company operating a railroad is required to use on each locomotive engine an "efficient spark-arrester." It is not practicable to use perfect spark arresters. Spark arresters are used, but they are not sufficiently effective. Railroad locomotives set many forest fires; and in the forest regions of the state it is a sad fact that very many miles of fresh and beautiful forest scenery that would have made the route of travel attractive, have been blackened and ruined by fires set by sparks from locomotives. As a better means of preventing such fires the last legislature enacted that,

"In dry seasons every such company (operating a railroad) shall employ at least one patrolman for each mile of its road through lands liable to be overrun by fire to discover and extinguish fires occurring near the line of the road, by which is meant a distance within which a fire could usually be set by sparks from a passing locomotive."

The phraseology of the act containing this provision was approved by the Attorney General's department before it was introduced in the legislature, but the railroad companies did not comply with the requirements. Several prosecutions were instituted for their neglect to do so, and in the case of the State against the Crookston Lumber Company, which arose in Beltrami County, the three judges of the District Court of the 15th Judicial District held this provision to be invalid on the ground of "Uncertainty and indefiniteness." The State cannot appeal in criminal cases, and it has not been practicable to obtain the ruling (which would have been very useful) of the Supreme Court in the matter.

Since our Minnesota law was enacted, the State of New York has enacted a law to accomplish the same purpose, but expressed in a different way, and which perhaps can be copied by the Minnesota legislature. It was enacted May 25, 1909, and is as follows:

Fire Patrol by Railroads. All railroads operated through forests in the forest preserve counties of the State shall at their own expense organize and maintain a competent and efficient fire patrol to protect the forests from fires which may be set or occur by sparks or coals from railroad engines upon or adjacent to the right of way or lands of such railroads, and unless otherwise directed by the commissioner, such patrol shall be maintained continuously from April first to November first of each year. If such railroads do not organize and maintain such fire patrols, or if in the judgment of the commissioner they do not organize and maintain fire patrols which are adequate and sufficient to protect and save the forests from fires which may be set or occur upon or adjacent to rights of way or lands of such railroads, then the commissioner shall organize and maintain such fire patrol in such manner and under such rules and regulations as he shall from time to time deem proper. Game protectors may, so far as public interest will permit, be detailed by the commissioner to act as such patrols. The persons placed upon patrol of railroad lines and lands and railroad rights of way, and lands and ways adjacent thereto, as herein provided, shall be transported without charge from point to point, as their duties shall require, by the railroads along whose lines such fire patrol is being maintained. The commissioner shall keep, or cause to be kept, an account of the cost of organizing and maintaining such fire patrol along the line of any such railroad, including therein the salaries, expenses and wages of public officers or employees engaged in organizing and maintaining such fire patrol, and the total cost thereof shall be paid to the commissioner by the railroad along whose line or lands or rights of way such patrol is maintained, such payment to be made on the first day of December of each year."

PROSECUTIONS.

Sixteen years ago 418 people perished in the Hinckley forest fire. Chisholm was destroyed less than two years ago by a forest fire. No one can tell when a fire, small at first, may be driven thirty miles by a gale and cause great destruction. We must put a stop to forest fires. I do not know of any better way to do this than by a strict enforcement of the law, without fear or favor.

A respectable citizen may from over-confidence set fire which he cannot control. But for a person to set fire in the vicinity of forest or prairie with intent to let it run wild, is no better than stealing.

It is, of course, an unpleasant duty for wardens to institute a criminal prosecution against any of their fellow citizens; and there is a general tendency for them to beg off from performing the duty. But a mild enforcement of the forest fire law is not the truest kindness. If we refrain from prosecuting violations of the law for fear we shall hurt someone's feelings, we shall not stop negligence in the use of fire. The law should be enforced rigorously, but of course impartially.

I regret to say that it is often the case that justices of the peace are too lenient, also too inexperienced in the administration of the forest fire laws.

I regret that in some important counties I do not receive the assistance from county attorneys that I have a right to expect.

APPROPRIATIONS FOR PROSECUTIONS.

The area of country in Minnesota exposed to forest or prairie fires is 25,000,000 acres, and at least $15,000 should be furnished the Forestry Commissioner for detective work, for payment of attorneys and for witness fees, to secure a thorough enforcement of the law. The appropriation now for prosecutions is only $2,000 annually. How can any one expect the law to be rigorously enforced with such a small amount of money?

FORMS FOR PROSECUTIONS.

To facilitate the work of wardens and attorneys, the following forms of complaint were carefully prepared and issued:

FORMS OF COMPLAINT FOR PROSECUTIONS UNDER THE FOREST FIRE LAW OF MINNESOTA.

(Wardens will carefully preserve this and turn it over to their successors.)

CIRCULAR
No. 39.

STATE OF MINNESOTA,
OFFICE OF FORESTRY COMMISSIONER.
ST. PAUL, March 15, 1910.

The following forms of complaint have been approved by the Attorney General's department, and will serve as a guide to fire wardens and justice courts in the prosecution of offenders. With these few forms it should not be difficult to properly draw complaints covering any other violations under the Forest Fire Law.

C. C. ANDREWS,
Forestry Commissioner.

KINDLING FIRE AND LEAVING IT UNQUENCHED.

STATE OF MINNESOTA, } ss.
COUNTY OF................ }

....being first duly sworn, makes complaint on oath and says:

That..did on the............................. day of..................................A. D. 19......, at the town of.................. in said County and State, kindle a fire near to forest (or prairie, if such was the fact; do not state both forest and prairie) land and left it unquenched; (if the kindling of the fire was by someone acting under his direction, allege, "cause to be kindled a fire"), contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said..may be arrested and dealt with according to law.

Subscribed and sworn to before me this..........................day of ....A. D. 19.........

....
Justice of the Peace.

NOTE—The above form of complaint is under Section 1787, Revised Laws of Minnesota 1905, as amended by Chapter 182 of the Session Laws of 1909. The evidence must show that the defendant set the fire, or caused it to be set, and left it unquenched. The testimony of one or more credible witnesses who saw the defendant set the fire and leave it before extinguishing it is the best kind of evidence; but the offence may be proved by circumstantial evidence.

FIRE WHICH ENDANGERS PROPERTY OF ANOTHER.

STATE OF MINNESOTA, }
} ss.
COUNTY OF.................. }

....being first duly sworn, makes complaint on oath and says:

That..did on the.............................. day of.............................A. D. 19......, at the town of.............................. in said County and State, negligently and carelessly set on fire (or cause to be set on fire) woods (or prairie, or other combustible material, describing it, if such was the fact—do not allege more than one), by means whereof the property of another was endangered, contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said.. may be arrested and dealt with according to law.

....

Subscribed and sworn to before me this..............................day of ....A. D. 19.........

....

Justice of the Peace.

NOTE—The above form of complaint is under Section 1787, Revised Laws of Minnesota 1905, as amended by Chapter 182 of the Session Laws of 1909. The evidence must show that the defendant carelessly and negligently set the fire, or caused it to be done, and that the property of another was endangered thereby. The testimony of one or more credible witnesses who saw the defendant set the fire is the best kind of evidence; but the offence may be proved by circumstantial evidence.

CAMP FIRE WITHOUT CLEARING GROUND.

STATE OF MINNESOTA, }
} ss.
COUNTY OF.................. }

....being first duly sworn, makes complaint on oath and says:

....did on the.................................... day of....................................A. D. 19......, in a dry season, at the town of....................................in said County and State, start a fire in the vicinity of forest (or prairie) land for cooking (obtaining warmth or for any industrial purpose, naming it, if such was the fact) and did, before lighting the same, fail to clear ground from all branches, brush wood, dry leaves and other combustible material, within a radius of 10 feet from the fire, contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said ....may be arrested and dealt with according to law.

....

Subscribed and sworn to before me this..................................
day of..................................A. D. 19........

....
Justice of the Peace.

Note—The above form of complaint is under Section 1787, Revised Laws of Minnesota 1905, as amended by Chapter 182 of the Session Laws of 1909. The evidence must show that in a dry season the defendant set the fire in the vicinity of forest or prairie land fôr cooking, obtaining warmth or other industrial purpose; and that before lighting the same he failed to clear the ground from all branches, dry leaves or other combustible material, within a radius of 10 feet from the fire. The testimony of one or more credible witnesses who saw the defendant set the fire under the above conditions is the best kind of evidence; but the offence may be proved by circumstantial evidence. Proof that there had been no rain of consequence for two weeks should show it was a dry season.

ALLOWING FIRE TO BURN OR SMOULDER IN A DRY SEASON.

State of Minnesota, }
} ss.
County of............... }

....being first duly sworn, makes complaint on oath and says:

That..was, on the..........................
day of..................................19......, the owner (or occupant) of land situate in the town of......................................in said County and State, and did, at said time and place, in a dry season, use fire (or allow fire to be burning or smouldering, if such was the fact) on said land, contrary to the form of the Statute in such case made

and provided, and against the peace and dignity of the State of Minnesota, and prays that the said... may be arrested and dealt with according to law.

....

Subscribed and sworn to before me this..............................day of ....A. D. 19.........

....

Justice of the Peace.

NOTE—The above form of complaint is under Section 1787d, Revised Laws of Minnesota 1905, as amended by Chapter 182 of the Session Laws of 1909. The evidence must show that the defendant was the owner or occupant of land and used fire or allowed fire to be burning or smouldering on said land, as the case may be, in a dry season. The testimony of one or more credible witnesses who saw the defendant use fire or allow it to be burning and smouldering under the above conditions is the best kind of evidence; but the offence may be proved by circumstantial evidence.

RAILROAD COMPANY FAILING TO CONCENTRATE HELP TO EXTINGUISH FIRE.

STATE OF MINNESOTA, }
COUNTY OF................ } ss.

....being first duly sworn, makes complaint on oath and says:

That...was, on the........................ day of..........................A. D. 19......, and ever since has been, a corporation duly organized, created and existing under the laws of the State of..., and did, at the town of ...., in said County and State, operate a railroad; that at said time and place, in a dry season, a fire occurred near the line of its said road, and that said.. did fail to concentrate help and adopt measures which were available for the extinguishment of the fire, contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State of Minnesota, and prays that the said ....may be arrested and dealt with according to law.

....

Subscribed and sworn to before me this.. day of..A. D. 19.........

....

Justice of the Peace.

NOTE—The above form of complaint is under Section 2037, Revised Laws of Minnesota 1905, as amended by Chapter 182 of the Session Laws of 1909. The evidence must show that the defendant operated a railroad as alleged in the complaint; that a fire occurred on the line of its railroad and that certain help and measures were available, but that the defendant failed to concentrate such help for the extinguishment of fire. The testimony of one or more credible witnesses who saw the fire; that certain help and measures were available for its extinguishment, and that the defendant failed to use them, is the best kind of evidence; but the offence may be proved by circumstantial evidence. This complaint is drawn on the assumption that the defendant is a corporation. The best evidence that defendant is a corporation is a certified copy of its certificate of incorporation. That the defendant operates a railroad in the particular locality in which the offence is alleged to have been committed may be shown by the testimony of a ticket agent or managing agent of defendant, or some other person who will testify that he has knowledge of said fact.

The above forms of complaint are approved.

CLIFFORD L. HILTON,
Assistant Attorney General.

St. Paul, March 2, 1910.

AFFIDAVIT FORM FURNISHED WARDENS.

Keep this as a guide and turn it over to your successor.

The county attorney cannot be expected in all cases to be present at a trial. But when there are good reasons for his presence, the warden or person prosecuting should lay the facts before him and offer to make oath to a complaint. In such case it is desirable to furnish him with the affidavit, or, if that is not practicable, a written statement signed by the witness of the main facts such witness will swear to. Even if the county attorney is not to try the case, it is useful, whenever practicable, to have without delay such affidavit or statement. The witness will be more apt to stick to the facts at the trial. The warden should retain a copy of the affidavit or statement; also immediately send a copy to the Forestry Commissioner. Where a justice understands his duty, the prosecution may sometimes be conducted without the assistance of an attorney for the State.

C. C. ANDREWS,
Forestry Commissioner.

St. Paul, March 15, 1910.

FORM OF AFFIDAVIT.

The following will answer for a form of affidavit. Witnesses must not state conclusions, but simply facts and circumstances. It is for the Court to draw conclusions from the evidence.

STATE OF MINNESOTA, }
} ss.
COUNTY OF................ }

...., being duly sworn, says he resides at......................................, that his occupation is that of ....and that his age is.................... (It is not important to state his age unless it be under 21 years); that on the ....day of....................................(Then let him state what he saw and knows, his means of seeing and knowing. If it relates to a fire, state the kind of weather. He can state any circumstance showing that accused did as alleged. He can state any admissions of the accused, but he should not state what anybody else said.)

(Affiant's Signature..

Subscribed and sworn to before me this..................................day of ...., 19........

....

(Signature of Notary Public or Magistrate.)

RANGER SERVICE.

The law for the employment of rangers is as follows:

"The commissioner shall divide into districts the territory exposed to forest or prairie fires, and, in a dry and dangerous season, employ for each district a ranger, who shall have the power and perform the duties of fire wardens, go quickly over his district to see that fires are prevented or extinguished, and shall inspect, assist or compel the activity of local wardens. He shall by frequent reports keep the commissioner informed of his movements. He shall inform himself of the location of timber belonging to the state and use efforts to protect it from fire and trespass. In the employment of rangers, preference shall be given to cruisers or woodsmen, game wardens and forestry students who are known for reliability and efficiency. Each shall perform service in any district to which he is assigned. Rangers shall be paid for their services by the state out of the emergency fund, on verified vouchers, approved by the commissioner, at the rate of not exceeding five ($5.00) dollars per day for the time actually employed and necessary and reasonable traveling expenses, and for which receipts shall be attached to their vouchers, the same to be filed in the State Auditor's office."

The annual appropriation to carry the above provision into effect is only $14,000, a part of which has to be used in paying fire wardens and fire fighters. The appropriation should be six times as much.

The State of Maine appropriates $40,000 annually for preventing and extinguishing forest fires in its unorganized townships. The organized towns take care of themselves.

I was able to employ last year only twenty-four rangers, and the most of them for only three months, but I feel satisfied that the service was valuable and worth more than it cost.

FOREST FIRES IN 1910.

Although the forest fires of this year do not properly come within this report, I will here refer to those which recently occurred. The spring of 1910 opened remarkably early. There was warm weather in March. April and the first part of May were excessively dry with much wind. Many forest fires occurred, and the newspapers contained exaggerated and sensational accounts of them. Altogether, 186 reports have been received from fire wardens of as many fires, which in the aggregate,, burned over 110.375 acres of ground, but mostly cut-over and brush land, and which did damage to the estimated amount of $184,045. The number of persons engaged in fighting these fires was 1,960.

Probably there were very few fires which were not looked after and reported by the wardens. The wardens and persons who fought these fires are entitled to much credit for their prompt and energetic efforts.

COULD NOT MOST OF THESE FIRES HAVE BEEN PREVENTED?

These fires were caused by careless people clearing land and burning brush, by people who had waited too long before burning their slashings and attempting to do it in dry weather and without piling, and by railroad locomotives.

As is probably well known, under our system the three town supervisors and town clerk of each town are fire wardens. They receive copies of the forest fire law and other instructions from the Forestry Commissioner early in the spring, and they are paid twenty-five cents an hour and their expenses when on duty. The law expressly requires that they

"shall take energetic precautions to prevent forest and prairie fires."

They shall "patrol their districts in dry seasons," "and with the approval of the commissioner employ patrols to guard against carelessness in the use of fire."

The wardens know who in their towns are liable to be careless with fire, and it would seem that if they had taken "energetic precautions to prevent fires" most of the fires would have been prevented. The supervisors acting as wardens, are often busy farmers; but their acquaintance with the people and their official influence ought to enable them better than any other local authority to prevent forest fires in their respective towns.

If we could find a competent man in every town for the position—but which is doubtful—it would seem that a person acting as fire warden, game warden, road inspector and police officer could make himself sufficiently useful to warrant remuneration that would make it for his interest to be active.

If I had the money that I asked the legislature for ($28,000) and which the House voted without a word of objection (the Senate reduced the amount one-half) I could have had rangers at work during the late dry season and doubtless could thereby have prevented many of the fires.

The cheapest way to fight forest fires is to **prevent** them.

A severe rather than a mild enforcement of the forest fire law would be the truest kindness to all concerned, but, as might be expected, justices of the peace in the new settlements are too lenient with their townsmen who are tried for negligence in causing forest fires. Our weak system of local justice is a serious hindrance to the proper enforcement of the forest fire law.

FOREST FIRE RISKS HAVE INCREASED.

The public ought to remember that forest fire risks are much greater now than when the service began fifteen years ago. At that time such large counties as Beltrami, Cass and Koochiching were forest solitudes, without a single organized town. Now they have ninety such towns, thousands of new settlers who want to clear their land, and hundreds of logging camps.

Minnesota contains one hundred million dollars worth of forest, yet the legislature appropriates annually only $21,000 to protect it from fire.

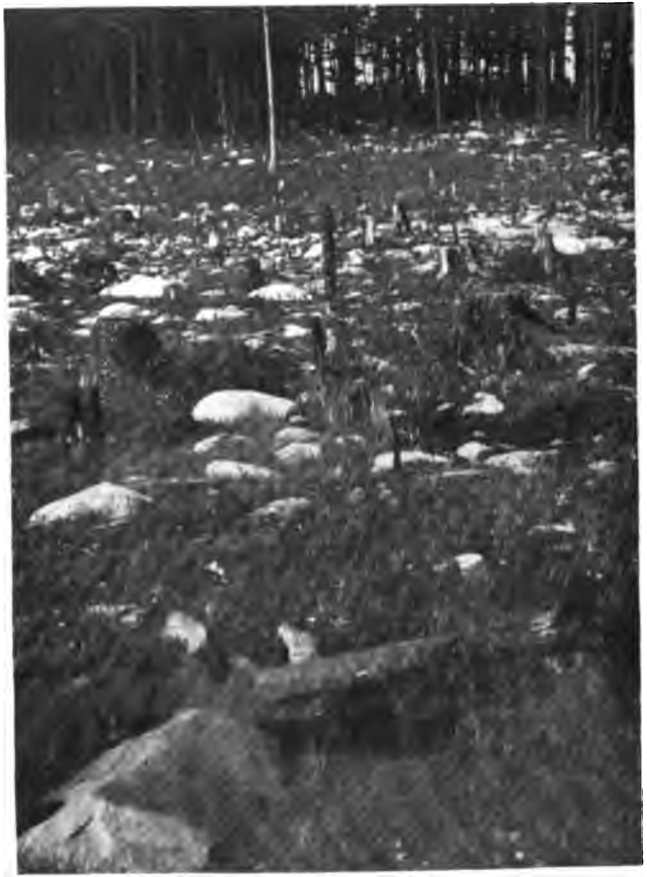
The various cities and villages in Minnesota expend annually $2,000,000 for fire protection, yet the loss by fires the past year was $6,000,000. Compare this with the forest fire service.

EQUIPMENT OF THE FORESTRY COMMISSIONER'S OFFICE.

Any competent statesman will believe me when I say that the office of Forestry Commissioner is not adequately equipped. The Forestry Commissioner has for some years been doing the work of a clerk besides that of commissioner. He should have an assistant worth $3,000 a year, and a chief clerk worth $2,500 a year. These officers should succeed each other in the field work so that they would keep in touch with it. A deputy located two hundred miles away and through whom instructions to wardens or rangers would have to be transmitted and delayed would not be of much help. The rangers and wardens should be in close touch with the central office.

As before stated, the forests in Minnesota are worth $100,000,000. They are being reduced by consumption at the rate of about ten per cent, or $10,000,000 annually. Many of the trees have ceased growing and some are in their decline; but the increase in value of these forests as a whole, by the annual growth of the timber, is about two per cent net, or $2,000,000 a year. The forests are property that are not and cannot be insured. It is this property that the Forestry Commissioner is required to protect from fire. He has to instruct and keep on the alert over a thousand wardens, some of whom make no charge for their services. He is besides expressly required by law to disseminate information on forestry. He must be familiar with the science and practice of forestry; and must likewise have the training and skill to properly discharge important official duties. The office is one of dignity, but its influence is impaired by having its rank, in respect to pay, only that of a second-rate clerk. This is not good policy for the State.

late Col. John S. Cooper, of Chicago, conversing with Mr. Cristaloro, of St. Paul, on the island in Cass Lake, at the time, October, 899, that he conducted a Congressional party, including Hon. Joseph i. Cannon, to Cass Lake. Col. Cooper is the one wearing glasses; he boy standing on the left is a Chippewa of mixed blood.



Cut-over white pine land in Minnesota unfit for the plow. Such land should be owned by the State, planted with pine and kept in forest.

TRUE FOREST CONSERVATION.

REMARKS OF GENERAL ANDREWS, FORESTRY COMMISSIONER OF MINNESOTA, BEFORE THE BROTHERHOOD OF PLYMOUTH CHURCH, ST. PAUL, FEB. 17, 1910.

To promote development, Congress disposed of the Minnesota forests in a lavish manner. They are now mostly owned by private parties, who for their financial safety must and will cut the timber as fast as there is a market. Indeed, it is a principle of forestry that when a timber tree has ceased to earn good interest by its growth, it has reached its fiscal age and should be cut if there is a good market for it. Fully a billion board feet of timber is now being cut in Minnesota annually, worth, as it stands, ten million dollars. When sawed at the mills its value is doubled. Our Minnesota forests are increasing by growth at about the net rate of two per cent, but are being consumed at the rate of ten per cent. As the mother of a leading industry they will be exhausted in about a dozen years. Take the entire country, the annual consumption of forest products is three times the annual growth.

True forest conservation, therefore, with us in Minnesota means a renewal of the forest by planting with pine such of the cut-over land—and of which there are a few million acres—as is not suitable for agriculture. This land and air, light and rain, from which the pine derives its principal food, constitute a natural resource that is not being utilized. On such land it takes 80 years for the pine to grow to scant saw-log size. Individuals will not wait so long for a crop; the state must undertake the work, just as is done in Europe. Germany plants a hundred thousand acres annually. Of course, there will be some natural reproduction. But at present not more than five per cent of the cut-over pine lands in Minnesota have become well restocked naturally with valuable kinds of trees.

Remember that population in this country has from the first settlement increased at the average rate of eighteen per cent every ten years; at which rate, in 80 years, when the pine forest we plant today will be ready for market, it will reach the enormous numbers of 320,000,000! What will the demand for forest products be then?

We can add greatly to the wealth, prosperity, healthfulness and beauty of our state by reforestation on a noble scale. There is a constitutional amendment to be voted on next November, which, if adopted, will, by a tax of one-fifteenth of a mill on the dollar (equal to seven cents on $1,000), raise $72,000 annually for reforestation.

In twenty years forestry will have made great progress in Minnesota. Will it not be a satisfaction for you who are then living to look back and feel that when it was rising from its cradle you gave it a helping hand?

PROPOSED CONSTITUTIONAL AMENDMENT FOR REFORESTATION EXPLAINED.

On the eighth of November next the electors of Minnesota will have a chance to make an X on a separate pink ballot opposite the proposed constitutional amendment for an annual tax of one-fifteenth of a mill on each dollar of taxable property (equal to seven cents on each thousand dollars) for reforestation. To adopt the amendment requires a majority of all votes cast at the election. The elector will probably first vote for the several candidates for state offices, members of the Legislature, county officers and representatives in Congress, whose names will be on another ballot, and he may feel too much in a hurry to stop to vote for this amendment. Besides, there is a natural feeling in every one to vote against an increase of taxes. So, in spite of all the talk for reforestation, this amendment is liable to fail.

SANDY LAND USED.

If the amendment be adopted, there will annually be raised about $72,000, which the forestry board can use in the purchase at not over $3.00 per acre of forestry land and in planting it according to forestry principles.

Naturally, land at that price will be mostly sandy or rocky, and only fit to produce pine trees. The experience of Germany shows that pine planted on such land will, on an average, yield 18,000 board feet per acre in eighty years, at which time the trees will be about twelve inches in diameter breast high, and that the investment will net three per cent compound interest. The present generation will get the benefit of most of the $72,000 yearly in payment for labor. Future generations will get the timber, and the public generally will derive benefit in the increase of wealth, in increased beauty of scenery, improvement of climate, soil, water-flow and covert for useful game. Good roads go with forests. The European state forests are health and pleasure resorts for the people.

WHY THE STATE SHOULD UNDERTAKE REFORESTATION.

Since its first settlement the population of the United States has increased at the average rate of eighteen per cent every ten years. At the same rate it will in eighty years be 320,000,000.

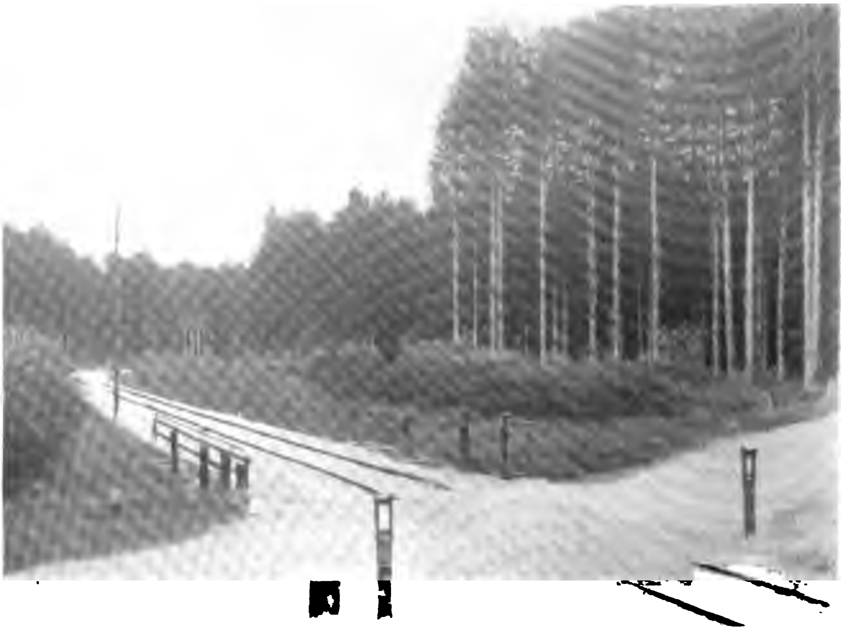
It is very seldom that individuals will plant forests when they have to wait eighty years for a crop. The State must do it. Of the present cut-over pine lands in Minnesota, only about five per cent have become well restocked with valuable kinds of timber. It would take centuries for Nature alone to restore our forests. Nature has a better chance to renew forests in Prussia than in Minnesota; yet Prussia plants fifty thousand acres of forest annually.

The question is sometimes asked, why should the state buy land when it now owns land? The land which the state owns is school and state institution land, which, according to the constitution, must be offered at public sale—the school land at not less than $5.00 per acre, and the state institution land at not less than $3.75 per acre, the proceeds to go into permanent funds. Besides, the most of the state land will be utilized for agriculture.

As a source of a leading industry, the Minnesota forests will be exhausted in a dozen years. The State should begin reforestation.

It will give our State honorable distinction if she adopts this amendment. Every public-spirited citizen should try and have his county give it a handsome majority.

A German Oberförster (district manager) and his assistants.



Railway crossing at Freudenstadt, Germany, 50 meters wide cleared along line, with young oak and other trees planted. Along such railways the fresh forest scenery is beautiful and attractive. Our Minnesota railroad companies can profit by such an example.

European Forests.

Through the kindness of a number of European forestry officials and of a few of the diplomatic representatives of the United States, I am able in this report to present sketches of the forests and forestry of nineteen countries of Europe, as follows:

1. Alsace-Lorraine,
2. Austria,
3. Baden,
4. Bavaria,
5. Bulgaria,
6. Denmark,
7. France,
8. Hesse,
9. Italy,
10. Norway.
11. Prussia,
12. Russia,
13. Saxe-Meiningen,
14. Saxony,
15. Saxe-Weimar,
16. Spain,
17. Sweden,
18. Switzerland,
19. Wurtemberg.

ALSACE-LORRAINE.

STATE FORESTS.

Aggregate extent of the state forest is 346,318 acres. Besides, the state possesses, together with two towns and two villages, 40,630 acres of undivided forests. In Alsace-Lorraine we have to distinguish the mountain system of the Vogesen, the valley of the Rhine and the tableland of Lorraine. The highest point has 1,424 meters and lowest 106 meters. Prevailing kind of trees: Beech, oak, fir, pine and spruce. Fir and pine are, on an average, cut at the age of 120 years, and spruce at the age of 100 years. Branches that cannot be sold are burnt.

The timber is worked up and sold to the highest bidder; exceptionally by private contract.

The annual expense of administration, including forest guards, is $235,079. This does not include forestry instruction nor the purchase of additional lands. The annual revenue on the capital invested is 1.5 per cent.

A kind of selection cutting is mostly practiced. Of the cut-over land, sixty per cent becomes reforested by natural seeding. Thirty per cent by artificial planting and ten per cent by artificial sowing. In 1907, 3,131 acres were planted. Fir, spruce and beech are planted when at the age of from 3 to 5 years; 1.20 m., or about four feet apart; pine and oak at the age of from 1 to 2 years. The expense per acre, $10.

The damage by forest fires is very little. The means for preventing fires are, code of laws, fire-lines and watching by the forest guards.

For every 1,000 acres of forest 35 experienced forest workmen are employed.

On an average, 13,933 acres are under the supervision of a technically trained "Oberfoerster." Average salary, $1,000; allowance, $550, besides the use of unfurnished house or an equal compensation. After ten years a pension which increases from one-fourth to three-fourths of the salary. The highest forest official is the "Landforestmeister," with the rank of "Ministerialrat"; average salary, $2,200; allowance, $550.

Instruction in forestry is obtained in German forestry academies and forestry schools and in German universities.

PRIVATE FORESTS.

Aggregate extent of private forests, 723,310 acres, being owned by towns, villages, public institutions or private individuals.

The forests of the towns, villages and public institutions to the extent of 504,685 acres are managed on forestry principles. There is a certain supervision by the code of laws in consideration of clearing and reforestation.

The average value of the private forests may be roughly estimated at $225 per acre. The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one-half a cord of fuel.

The population of Alsace-Lorraine is 1,845,000. The area of the entire territory is 3,628,000 acres. The annual yield of raw material from the forests is 61.1½ cubic feet per acre. Of this amount, 45 per cent consists of timber, and 55 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cutting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to 1.5 cents per cubic foot. At this price the workmen earn 52 cents per day. The value of the timber, without bark, dragged to forest roads, is 11 cents per cubic foot, on an average. The value of fuel, piled up along roads, is 5.4 cents per cubic foot, or about $3.42 per cord. (The stumpage of timber is worth about $12 per 1,000 feet, board measure.) In the state forests about $100,000 are spent annually for road improvement and forest railroads. In the private forests the exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. Likewise in about half of the state forests the "Oberfoerster" manages the right of hunting by order of the government. In the state forests these leases yield annually 10 cents per acre. In the season of 1907, for instance, there were killed, in the administered districts of the state forests aggregating 189,580 acres, 303 head of red deer, 566 head of roe deer, 226 head of wild boar, 1,740 hares and 13 capercailzies, *tetrao urogallus* (mountain cock), besides a number of minor animals.

AUSTRIA.

STATE FORESTS.

The entire forest area of Austria is, in round numbers, 24,000,000 acres, of which the state administers 2,573,940 acres of actual forest, and of which 800,000 acres belong to religious, educational or charitable endowments. Under the Department of Forestry there are eight territorial offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58,993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.

Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.

Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the larch, occupying 5 per cent. A small area only is in possèssion

of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hardwoods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter decreasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However, spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata*) is mostly found mingled with beech, horn-beam and spruce. It does not run as high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europæa*) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris*) is found in the Alps and

in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.7 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia, Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca*) is very scarce on the whole. On the south slopes of the Vienna mountains it forms small forests. It is fond of the sunny side and of calcareous ground.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to $8.91. It is likely to range between $3.50 and $20 per acre, according to the possible yield.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, sylviculture, etc.	$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings.	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc.	87,193.67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc.	418,499.05
V. For public expenses (taxes and charity expenses).	259,867.44
VI. Money refunded	756.13

VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of boundary lines, forest working plans, prescriptive rights, etc.)	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the ministry of agriculture)	151,340.20
Grand total expense	$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.)	$1,727,805.73
II. From agriculture (rentals from land leased, etc.)	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.)	291,747.02
IV. Money refunded	6,524.15
V. Extraordinary revenue	19,492.24
Total receipts	$2,207,161.30
To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at	290,336.40
Therefore grand total gross receipts	$2,497,497.70
Deducting from this amount the expenses previously mentioned, there remains a net revenue of	$693,741.81

Thus the entire state and fund forests of the Austrian empire have netted on an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of $28,586.01 for labor only. To these planting ex-

penses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper	$17,894.78
II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years	6,406.72
IV. Spades, picks, mattocks and other tools	834.02

Adding these items to the above named figure of $28,586.01, the grand total expense for replanting amounts to $55,416.49, or to $3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these, 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural

regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under the state forest management is pretty constant, whilst it is more or less subject to changes in the different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina being extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the logs than the inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two or three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission,

no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to $1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the time thus prescribed a second punishment shall take place." Paragraph 3: "Areas cleared from forests are to be planted up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to $3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 acres, and causing a loss of $163,904. On the yearly average, 601 forest fires have run over an area of 3,862 acres, involving $32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, while the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests, drawing a salary of $364 to $405 per annum, to which there must be added an additional pay varying from $64 to $162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration, drawing a salary of $445 to $526, with an additional pay varying from $81 to $202; eighth rank, a forest master, or inspecting officer, draws a salary of $567 up to $729 and an ad-

dition from $97 to $243; seventh rank, a forest counselor draws a salary of from $810 to $972 and an additional pay of from $142 to $283; sixth rank, a superior forest counselor draws a salary of from $1,134 to $1,458, in addition to a pay of from $162 to $324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government buildings, paying a rent equal to one-half of the additional pay above mentioned.

PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres (out of which 862,236 were unproductive area), there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land

has been sold actually at prices ranging between $5 and $340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit, after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the diminished area is partly explained by mistakes made formerly in the survey of the forests.

DUCHY OF BADEN.

STATE FORESTS.

The aggregate extent of the state forests of Baden is 248,000 acres, located in the Black Forest, the upper val-

ley of the Rhine and in the Odenwald. The prevailing kind of trees is the spruce. Reforesting is effected by seed from standing trees; also by planting trees; in some rare cases by artificial sowing, the latter in the case of Scotch pine. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the forest law of Baden of the year 1833, no part of any forest is allowed to be kept uncultivated.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Forests and Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councillors of the Forest Board, and have a salary not exceeding $1,380, and $147 for expenses.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

PRIVATE FORESTS.

About one-third of all private forests is managed on forestry principles. The total forest product of the country increases gradually.

BAVARIA.

STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its state forests comprise 2,150,000 acres, and are mostly managed as "selection" forests. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers, red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is $50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to $4,965,204. The total revenue from the forests the same year amounted to $8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforesting is mainly done in the natural way. In the case of the fir (*pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly

crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforesting is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only $974, in 1894 only $1,686. The principal cause of such fires is the carelessness of the workingmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath."—ministerial or cabinet councilor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would, of course, also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

FORESTRY IN BULGARIA.

Bulgaria, bordering the west coast of the Black Sea and the south bank of the Danube, was in antiquity a part of Thrace. That, in the drama of "The Gladiator," was the native land of Spartacus. Now a slave and gladiator, he had, he says, in boyhood looked from the "cloud-piercing Hoemus" upon a fertile country sloping to the mighty Danube, where "peace was tinkling on the shepherd's bell and singing with the reapers."

Bulgaria, with a population now of over four million, was for five centuries a province of Turkey, but gained its political independence thirty years ago. It has made rapid progress in recent years, and naturally forestry is one of the things that has received favorable attention from its enlightened government.

The total area of the forest in Bulgaria comprises 7,512,000 acres, being 30 per cent of the whole area of the country. Of these, 2,231,000 acres belong to the State, 3,866,000 acres to parishes, 132,000 acres to schools and 1,283,500 acres to private individuals. Scotch pine and other conifers, including fir (*picea pectinata*) and spruce, are the prevailing kinds of trees.

ADMINISTRATION.

The administration of the forests is by a bureau in the Ministry of Commerce and Agriculture, and consists of a chief, an inspector general of forests and two assistant chiefs. The budget for forests and forestry for the year 1905 was $150,000. There are six district inspectors, who have received scientific forestry training, 40 foresters who have received forestry training. There is a district inspector for each 1,250,000 acres and a forester for every 190,000 acres. There is a keeper to patrol the forest to every 3,500 acres. There are also many other employes. For the parish forests there is a forester for every 125,000 acres.

These facts are taken from an unusually able and fine volume entitled "Bulgaria of To-day," issued in 1907 by the Bulgarian Ministry of Commerce and Agriculture, and a copy of which was kindly sent to the Commissioner of Forestry of Minnesota by the British Diplomatic Agent and Consul General at Sofia, Sir G. W. Buchanan. The following are the concluding words of the chapter on forests in said volume:

"The improvement of our forests demands enormous sacrifices, but on the other hand a time will come when

Natural stand of jack pine in the Burntside forest; being the 20,000 acres granted to the State of Minnesota by Congress. There should be a forester for these 20,000 acres to plant the bare land and make necessary improvements. The State is educating foresters and there is work for them. The Forestry Board recommended an appropriation for each fiscal year of $10,000 for roads and trails, care and improvement of Burntside forest, but no money was appropriated.

the revenue from the forests will play an important part in the State budget. The Bulgarian Government, fully aware of its duties and its interests, concentrates its efforts to this end; to make our forests, by the simplest means, in the near future a source of riches, which are so sorely needed by the young State for the completion of its organization."

It is an interesting fact that Bulgaria, in territorial extent, is only half as large as Minnesota.

DENMARK.

STATE FORESTS.

The Danish state possesses forest areas as follows: Real state forests, 141,000 acres, of which 100,600 acres are grown with trees; parks, 2,840 acres, of which 1,520 acres are grown with trees; the forests of Sorõ Academy, 8,580 acres, of which 6,650 acres are grown with trees; and sandy downs plantations, 53,500 acres.

In the following information the downs plantations are not included; so the production area used as a basis of the information is accordingly 109,770 acres.

The surface of the country consists of diluvial formations with exception of the island of Bornholm, where the granite rock in many places reaches the surface. On the islands and in the eastern part of Jutland the soil consists of more or less fertile clay, sand, gravel and stones mixed together. Fertility is in most cases dependent on the quantity of clay. In the midland and western part of Jutland there are amongst the higher lying hilly parts larger, flat, meagre sand fields, heaths, overgrown with heather. They were formed in the glacial period by the masses of sand carried down by the rivers of melting water. Along the western coast of Jutland there are considerable stretches of sandy downs.

Of the above-mentioned area, 37.6 per cent are covered by beech, 3.6 per cent by oak, 5.9 per cent by ash, maple, birch, elm and alder, and 52.9 per cent by coniferous trees, especially spruce (*picea excelsa*). The planting on the Jutland heaths is almost exclusively effected with spruce and mountain pine (*pinus Montana*). If these plantation areas are deducted from the above-mentioned grown area, we find the productive area of the real forests to be about 90,000 acres, of which beech occupies 44 per cent, oak 4 per cent, ash, etc., 7 per cent, and coniferous trees 45 per cent.

The average annual cutting is about 215,000 cubic meters. Forest pine (*pinus silvestris*) is very slightly grown. It is generally cut in the 75th to 90th year and has then at a height of 0.3 meter above the ground, a diameter of 25 to 30 centimeters. The mountain pine (*pinus Montana*) is cut at an age of 40 to 45 years, and has then, at a height of 1.3 meter above the ground, a diameter of 8 to 10 centimeters. The spruce (*picea excelsa*) is cut at the age of 60 to 75 years, and has then, at a height of 1.3 meter above the ground, a diameter of 25 to 30 centimeters. The silver fir (*abies pectinata*) is cut at an age of 75 to 80 years, and has then a diameter of 30 to 35 centimeters. Tops and branches are laid aside in piles where it is possible to sell them as fuel. This is done everywhere where the forests are scattered. In the larger forests the thin branches (under 3 centimeters) are cut off and remain lying on the ground or are gathered and burnt, whereas the thicker parts are shortened to a length of one meter and sold as fuel. The state never sells timber standing; it is always cut down.

The administration of the state forests is under the Department of Agriculture; its yearly budget is voted under the general budget of finances and its officers are appointed by the king. The total annual expenditure (1906-1909) was 1,201,465 Kr. (333,740 Dollars). This does not include expenses for the instruction of forest officials or for experiments, as these expenses are paid conjointly by the state and the private forests. For a long series of years no new areas of land have been purchased, but the annual expenses for planting heath areas, formerly purchased, have been included in the above amount of expenditure.

The total annual gross revenue (1906-1909) was 1,718,088 Kr. (477,247 Dollars). The fact that the net surplus is comparatively small is to a great extent due to the fact that a considerable amount is spent on young plants on the heath areas of the state and the areas cultivated in this manner give no profit for a long series of years.

The greater part of the state forests have belonged to the state from time immemorial, so it is only in a smaller part of the forests in which capital has been invested by purchase.

The way of cutting depends upon what kind of tree is to be used for reforestation. If this is beech (*fagus silvatica*) or silver fir, the old cultivation is thinned by degrees, and the last trees are taken away 8 or 10 years after the first thinning. If spruce or oak (*quercus pedunculata* and *sessiliflora*, at times *rubra* and *coccinea*) is to be reforested, the area is cut clean in parts.

Beech is often, silver fir occasionally, reforested by natural seeding after cultivation of the ground; but generally both species of tree are reforested by planting; sometimes they are sown in rows, dug or hacked up. Oak is almost always sown in such rows. On the sowing of oak on fields for the establishment of a new forest the cultivation of the soil is completed, and it is then sown with seeds and acorns. Spruce and mountain pine are almost always planted.

About 1,500 acres are planted annually. The plants are generally 4 years old when they are planted. They are, as a rule, planted at a distance of 2 x 4, 3 x 4 or 4 x 4 from each other. Thirty to forty men will presumably be able to do the plantation work on one acre—taken as an average—at 75 to 110 Kr. per acre ($20.75 to $30.00).

Forest fires are rare, and they occur almost exclusively in the heath plantations in Jutland. Here at certain intervals, parallel with each other and vertical to each other, 9 meter broad rows, the so-called fire-lines have been placed, which are kept free of vegetation by ploughing. Alongside the railway similar fire-lines are found on stretches where there is a danger of fire.

The number of persons who are occupied in the state forests is very variable, according to the time of the year. The year round only 350 men are employed, but in the winter season, from November to May, this number may increase to 800 to 900 men, of whom, however, a good many are replaced in the planting time by women and larger children. The workmen employed all the year round have about 250 working days annually. Nearly all the workmen who have permanent employment live in houses which belong to the state forests; the remainder of persons occupied live in the neighborhood of the forests.

A scientifically educated forester (Skovrider) has on the average 6,000 acres under his supervision. The Skovriders receive a salary of 2,600 Kr., increasing to 3,800 Kr., free residence and about 30 to 80 acres of free service land. Some of them receive 400 to 1,000 Kr. for traveling expenses. They are entitled to receive a pension from the date of their appointment according to the same scale as all other Danish state officials, viz.: Years of service, per cent of average salary for the last 5 years.

From 0 to 2 years....	1/10%
From 2 to 4 years....	2/10%
From 4 to 7 years....	3/10%
From 7 to 10 years....	4/10%
From 10 to 20 years....	5/10%
From 20 to 21 years....	31/60%
From 21 to 22 years....	32/60%
From 22 to 23 years....	33/60%
Etc., etc.	
From 28 to 29 years....	39/60%
Over 29 years..........	40/60%

The scientific forest officers are: Two forest-masters who rank in the third class, but hold a higher rank, being court officials in addition. Their salary is 5,800 Kr., increasing to 6,600 Kr.; 23 Skovriders who rank in the fourth class and whose salary is mentioned above; one forest-valuer who ranks with a Skovrider and receives pay of 3,200 Kr., increasing to 4,000 Kr.; and 10 forest assistants who receive 1,400 Kr., increasing to 1,800 Kr. annually.

About the year 1700, but not before 1763, regular forestry, according to a fixed scheme, was introduced.

The higher forest officials for State or private forestry are educated in the Royal Agricultural Academy. The time of studying is six years, and the average number of forest students is about 40. The lower forest officials (foresters), of which there are about 90 in the hereinbefore-mentioned parts of the state forests, are not educated in special schools, but are instructed practically, as well as theoretically, in the districts during three years, subsequent to which they pass an examination before a State Commission.

Since 1904 working plans for the state forests are made for periods of 15 years. The division of the districts is revised, and the various parts are now only made of a size of 4 to 40 acres. The experimental department is not any more superintended by a forest-valuer, or forest-appraiser, but by an experimental chief, who is assisted by a commission. "Tidsskrift for Skovväsen" (Forest Review) is issued by Professor C. V. Prytz and forest assistant Fr. Brammer. "Det danske Hedeselskab" (The Danish heath Cultivation Society) has now its seat in Viborg (formerly in Aarhus). The state subvention for this society is now about 325,000 Kr. ($90,140) annually. Under the supervision of the Society (up until 1907) the area taken in for planting of trees is about 158,000 acres, of which about 65 per cent had been prepared for cultivation. The company itself owned at that time about 15,100 acres of plantation.

Scientific observations as to the influence of forest upon climate or upon rainfall have been made and are continuously being made, but hitherto no results have been obtained which could in any respect increase or alter old known experience.

PRIVATE FORESTS.

According to Statistical Reports of 1909, the area of the private forests, including forests belonging to local bodies, was 599,761 acres.

About 75 per cent of this area is managed or supervised by scientifically educated foresters. Of the said area 16,751 acres belong to local bodies, 176,933 acres are entailed property.

The system of taxation of private forests and of the products of private forests is the same as the system of taxation of other productive landed property (agricultural land for example). The forests are assessed for tax to the state according to their trade value, to the local bodies according to the annual net profit.

Private persons are prohibited by the law of September 27, 1805, from cutting away those remnants of the old forests of the country still existing in the said year. In cases of offense, means are placed in the hands of the government to force the owners to restock the cleared area under control of the state officer in charge. Consequently, but very few forest areas have disappeared in the course of the nineteenth century.

FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,600,000 acres; which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,800,000 acres; forests of the municipalities and of the

public institutions, 4,800,000 acres; forests of individuals, 16,000,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the cork oak (*quercus suber*), the evergreen oak (*quercus ilex*), the cluster pine (*pinus pinaster*) and the Aleppo pine (*pinus halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European oak (*quercus robur*), the European white oak (*quercus pedunculata*), the beech (*fagus silvatica*), the hornbeam (*carpinus betulus*), the common European ash (*fraxinus excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the silver fir (*abies pectinata*), the Norway spruce fir (*abies excelsa*), the beech (*fagus silvatica*), the Scotch pine (*pinus sylvestris*), the mountain pine (*pinus montana*), the larch (*larix Europea*).

STATE FORESTS.

The total area of the forests of the state, 2,800,000 acres, is composed of 2,200,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet)	38,100,000
Fire wood (cubic feet)	64,200,000
Total	102,300,000

This represents nearly an annual production of 46½ cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is $6,000,000, or $2.72 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as $8 per acre.

The expenses are as follows, viz:

Personnel	$1,240,000
Forest instruction	36,000
Sundry works	336,000
Reforesting of mountains	651,000
Taxes paid to departments and municipalities	405,000
Sundry expenses	57,000
Total	$2,725,000

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforesting mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed $1,500,000 or 70 cents per acre. The net annual income of these forests is therefore $2.72 less 70 cents, equal to $2.02 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations approved by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood

they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforesting from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying, and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintainance of forest roads, water sawmills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforesting has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is $10.00 per acre.

The State and Communal forests are organized and managed so as to obtain regeneration by means of natural seeding. A sufficient number of trees are left standing that they may entirely cover the ground with their seed.

It may happen that those trees are thrown down by a hurricane or destroyed by fire. In that case recourse must necessarily be taken to planting, but that case does not often occur. In the private forests the same method is generally applied as in the State and Communal forests. However, as these forests are felled at a very early age, the proprietors must restore them by planting. This only occurs in the regions of plains where pine forests are grown on barren ground with a view of yielding the largest possible revenue.

A forester, with scientific knowledge, *i. e.*, a ranger or assistant conservator (*Garde general ou Inspecteur adjoint* —these two officers fulfilling the same functions) has on an average to administer an area of 19,000 acres of State forests, Communal forest or forests belonging to a public establishment. They generally have at their command three chief guards and ten or twelve forest guards.

Properly speaking, there are no workmen who devote themselves especially to forest work. Most of them only come into the forests in the bad season; in summer time they work in the fields. The number of workmen employed for 1,000 acres can therefore not be given exactly. It varies according to the regions and the longer or shorter time that the workmen devote to the forest work. Many forests being surrounded with villages, many woodcutters repair to their homes every evening. However, when the forests are very large and require work too far situated from the villages, the workmen, in order to avoid too great a loss of time in the morning and evening, con struct huts in which they spend the night and cook their meals. The charcoal-burners, obliged to watch day and night over the kilns, always live in the forests.

Very considerable reforesting is made on mountain lands, where the State plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose $700,000 are expended every year, the largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The State purchases yearly, on an average, 16,000 acres. The average cost of reforesting is $20 per acre, and $18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 2 conservators, 3 administering general inspectors, 12 inspectors, 7 assistant inspectors and 19 clerks.

An exterior service composed of:

First—Personnel, superior or of administration—32 conservators, 200 inspectors, 210 assistant inspectors, 232 general wardens.

Second—Personnel, inferior or of surveillance—3,650 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director	$3,000
Administrators	$1,800 to 2,600
Conservators	1,600 to 2,400
Inspectors	800 to 1,200
Assistant Inspectors	600 to 800
General Wardens	300 to 520

Exclusive of some additional allowances for traveling expenses.

INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of ..	$160.00
Foremen and wardens paid by the municipal corporations and public institutions	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,800,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,600,000 acres. They produce annually, timber, 45,000,000 cubic feet; fire wood, 125,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 37 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is $6,500,000, or $1.41 gross income per acre. The net income is about $1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the president of the republic. These regulations and those of the state

forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve, and oftentimes leave none at all. One can notice, however, that the principles of sylviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of

drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of $4 to $20, carrying or lighting matches in or within a distance of 20c metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, and telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Al-

Carrying a canoe over a portage near Burntside State Forest.

geria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of $600,000.

GRAND DUCHY OF HESSE.

STATE FORESTS.

The productive forest area in 1908 amounted to 182,263 acres. The timber stands on nearly level land, 80 to 100 meters or on hillsides that rise to an elevation of about 800 meters above sea level. From a geological standpoint the soil of these forests varies considerably. Some being alluvial and diluvial sands, colored sandstone, granite, basalt, slate, quartz, etc.

The prevailing kinds of trees vary according to the mineral and physical nature of the land, as well as the climatic conditions of the locality. In general the standing timber is composed of 69 per cent hardwood and 31 per cent coniferous forest; 47 per cent of the hardwood being red beech. The fir ranks first among the coniferous species. In suitable localities or for the purpose of filling in here and there, are found oak, ash, maple, white beech, birch, alder, aspen, linden, locust, pine, fir, larch, white pine, weeping fir, Douglas pine, Sitka pine, etc.

The total yield of lumber and timber in 1908 was 129,606 cubic meters (4,575,091.8 cubic feet). Of this, 36,876 cu. m. (1,301,722.8 cu. ft.) was from hardwood trees and 92,730 cu. m. (3,273,369.0 cu. ft.) was from coniferous trees. The average cutting age in general was, for oak, 140 to 160 years; for red beech, 100 to 120 years; for fir, 100 to 120 years, and for pine 80 years.

Refuse, in so far as it is not suitable for lighter lumber such as laths or for pulp, is used for firewood, as is also the refuse from hardwood trees.

Standing timber is not sold to be cut by the buyer himself. The cutting is always done by the administration. Most of the lumber, also sills and mining timber, as well as pulpwood, is submitted to competitive bidders before cutting. The former (i. e. lumber, sills and mining timber) is sold per cubic meter and the latter per rough meter (i. e. as cord-wood is sold) and only after being awarded to the highest bidder is cut by the forest administration. The valuable milling timber and a part of the lumber is sold at public auction.

In 1909 the expenditures for salaries and for forest protection amounted to 630,336 marks ($150,019.97). Expenditures for wages, 1,773,738 m. ($422,149.64). The latter include cutters' wages, 1,047,059 m. ($249,200.04). Expenses of forest cultivation, 416,647 m. ($99,161.89). Expenses of road building, 237,567 m. ($56,540.94). Insurance of laborers, 72,465 m. ($17,246.67).

Expenses for forestry instruction and the purchase of additional lands are not included among the above named items.

The total gross income (from lumber and firewood) in 1908 was 4,882.066 m. ($1,161,931,708).

The capital represented by the forests, 22,128,000 m. ($52,665,354, figured at $714 per 2,471 acres), brought interest accordingly at 2.21 per cent.

For coniferous forest clear cutting is the rule. For hardwood trees, both methods are practiced about in the ratio of one to one.

The reforestation of cut-over lands is entirely through artificial planting or sowing.

For coniferous forests, planting is the rule, sowing the exception.

The former is used on 95 per cent of the cultivated areas, the latter on 5 per cent.

For hardwood (foliage) trees, the ratio of planting to sowing is about 75 per cent to 25 per cent. On the average about 700 ha. (1,729.7 acres) are annually planted. Fir trees are planted as one year old plants, 25 centimeters (9.84 in.) between each plant. On cultivated strips which are 1 m. (39.37 in.) apart.

Coniferous trees are planted as 3 to 4 years old nursery plants in holes 1¼ m. (49.2 in.) apart, three plants forming vertices of a triangle whose sides are 1¼ m. For the planting of one ha. (2,471 acres) of forest land in one day the following is required:

For cultivating the soil about 30 men with wages at 3 m. ($714)—$21.42.

For setting out the plants about 33 women with wages at 1.50 m. ($0.35)—$11.78. Total for wages, $33.20. To this must be added the cost of the plants, which is about 90.5 m. ($21.54). Total cost per ha. (2,471 acres), $54.74.

For reforestation by seed: Preparation of soil, about 55 men, 165 m. ($39.27.) Sowing of the seed, about 35 women, 52.5 m. ($12.49). Total for wages, 217.5 m. ($51.76). Cost of seed, 72.5 m. ($17.25). Total cost, 290 m. ($69.02). In case the nature of the soil permits, the use of the lately constructed forest plows noticeably lessens the cost of soil preparation.

The number of forest fires and damage resulting therefrom is generally inconsiderable. The total number of forest fires in 1908, with an area of 245,578 ha. (606,823 acres of state, communal and private forests) was 53. The total damage was $678.30 (2,850 m.) The means taken for the preventing of forest fires, in addition to a regular established corps of forest-protection officers, are, the establishment of a system of roads and lanes; the permanent establishment of fire protective stretches along railroads running through the forests; bordering a coniferous forest along a railroad with hardwood trees. A fire having broken out, which can not be extinguished by the available forest employes, requisition is made upon the fire brigades, respectively the inhabitants of the neighboring villages, to perform the necessary cutting or eventually to dig trenches for the localization of the fire.

In the state forests about 3,700 persons are annually employed on 150 working days in the year. All employes live in villages near the forests which (villages) are seldom more than 5 kilometers (3⅛ miles) distant.

The district under the supervision of a scientifically educated forester (Oberfoerster) comprises 1,960 ha. (4,843.16 acres) in the state and communal forests. The salary on entering the service is 2,800 m. ($666.40), and increases every three years until it reaches the maximum amount, which is 6,000 m. ($1,428) per year. This sum is attained after 21 years of service. Besides this salary the officer receives his official residence at a reasonable rent. In case no residence owned by the administration is in the district, a rental fee of 360 m. to 480 m. ($85.68 to $114.24), varying according to the locality, is annually allowed. For the keeping of a horse, 1,100 m. ($261.80) is annually allowed. When a horse is not kept, the necessary livery expense is paid. For other traveling expenses (on business) which takes the officer more than 2½ kilo. (1¾ miles) from his district and takes up more than 5 hours of his time, a daily allowance up to a total of 400 m. ($95.20 per year is granted. For stationery, stable-room and fuel, 500 m. ($119.00) yearly is paid. For the routine correspondence, a regular secretary is furnished him by the state. The pensioning of officers takes place in case the officer, on account of sickness or old age, cannot attend to the work. The pension salary varies according to the number of years of service, 50 to 100 per cent of the salary when last in active service. In case of death, the survivors (widow and minors) receive a fixed sum varying according to the number of years of service of the deceased.

The highest forestry board is the Ministry of Finance for Forestry and Domains ("Ministerium der Finanzen Abteilung fur Forst und Kameralverwalting"), which is composed of a Ministerial Councillor ("Ministerialrat"), who is chairman; of five supervisor Forestry Councillors ("Oberforestraten") and one lawyer.

The annual salary of the Ministerial Councillor is 7,500 to 9,500 m. ($1,785 to $2,261), according to number of years of service. Members of the Superior Council receive 5,800 to 7,200 m. ($1,380.04 to $1,713.60), according to the number of years of service. The Ministerial Councillor receives a rental fee of 760 m. ($180.88). The Superior Councillors, a similar fee of 576 m. ($1,370.88). For services rendered away from home, transportation is paid and a daily allowance of 9 m. ($2.142) for a day of over 6 hours, also 3 m. ($7.14) for hotel expenses.

After having served a number of years, the Ministerial Councillor advances to Privy Councillor, the Superior Forestry Councillors to Privy Superior Councillors, and the Superior Forester ("Oberfoerster") to "Forstmeister."

The scientific education of officers in the forestry service is obtained at Gieszen. The number of students from Hesse was, on the average, about 20 in the last year. The forest rangers' school at Darmstadt prepares young people for the common forestry service, and is, on an average, attended by 50 students, who later find employment in the state-communal and private forestry service.

For about 25 years weather bureaus have been established. However, the results concerning the influence on forest upon climate and rainfall have not yet been sufficiently determined.

PRIVATE FORESTS.

The area of private forests is 7,7033 ha. (190,348.54 acres). Private forests class 1, 53,556 ha. (132,336.87 acres). Private forests class 11, 23,477 ha. (580,116.67 acres). All first-class private forests are managed on scientific forestry principles by an educated forestry officer. These forests are all the hereditary possessions of families.

TAXATION OF PRIVATE FORESTS.

The value of the land is fixed for the purpose of taxation according to the prevailing local prices; value of this land being naturally much less than that used for agricultural purposes. The value of the land is arrived at by scientific principles, with reference to the stand and yield.

There is state supervision in private forests of first class. This supervision consists only in preventing the reduction of large forest areas (over 2½ ha.—6.17 acres) without the consent of the Superior Forestry Board. This permission is not required if at the same time or at some time previous an equal area of land has been planted.

As far as forests of the second class are concerned, the management of these is left entirely to the owner, with this proviso, that he make use of the forests in accordance with regulations; for example, that he do no cutting which would be considered *forest devastation.*

A total deforestation can only be undertaken with the consent of the Superior Forestry Board. Within three years, cut-over land must be prepared for reforestation; if not, the work is done by the Forestry Board at the expense of the owner. The high esteem in which the forests are held and the importance of preservation is generally appreciated by the common people. The inhabitants of larger cities, especially prize the orderly care of the forests.

The immaterial, ethical worth of the forest is being recognized more and more, and in reality represents an invaluable asset to the larger cities as resorts for air-cure and bathing.

ITALY.

STATE FORESTS.

The Demesne Forests, administered directly by the state, extend over a surface of 147,259 acres, of which the forests properly termed productive, 121,086 acres, are thus divided: Trees of full growth, 79,081 acres; trees large enough to cut, 42,005 acres. The principal species of trees in said forests are, considering them in declining order: Trees of high growth, oaks, beeches, firs, pines, larches and chestnut trees. Trees of less growth but fit to cut, oaks, beeches and chestnuts.

The districts according to their nature represent the greater part of the geological formations from the most ancient to the most recent.

The sale of timber is made with the trees standing, and is ordinarily by public auction as is prescribed in the law of the state relating to general accountability.

The average annual expense of administration amounts to 363,712 Lire. That was the computation for the seven-year period, 1892-1899, and, however, does not include that which is attributable to the five forests declared inalienable after that period of time and which extend over a surface of about 17,290 acres. No part of this expense relates to forestry instruction or to the purchase of new lands. Throughout the entire septennial period above mentioned the net revenue amounted to an annual average of 273,441 Lire.

The capitalized value of the forests is not known so far as to give the basis for ability to calculate the percentage of their annual net returns. Such return may be inferred, however, by reference to the entire forest area of about 103,788 acres, as it was prior to the aforesaid period and, therefore, brings the result of 2.63 Lire per acre.

The reforesting in all cases is made by seeding or artificial planting, except among the trees of lesser growth fit to cut, where it happens naturally by reason of reproduction from the stumps. On an average, provision is made for the reforesting of fifty acres of bare territory during each year in the forests of the state. In proceeding to set out trees we use those from nurseries or those grown from seed and of from one to three years' growth, and they are set out ordinarily in couples and in little depressions two meters apart; a task which requires 2,023 small plants and the labor of about forty men, entailing an expense of 80 Lire per acre.

In the forests of the state the fires of any importance are those which happen in the island of Sardinia, where the damage often reaches a great sum, but which, being extremely variable and of intermittent occurrençe, is not reducible to any average amount. The principal preventive measures adopted to fight the fires are guard-patrols and the construction of a network of lanes. For extinguishing such fires, provision is made for facing against the wind where it is possible and suppressing the flames by beating them down with fresh boughs. The flames proceed from the underbrush, which is the principal source of propagation for such fires. Often, recourse is had to "cesse" (improvised lanes) and, in exceptional cases, to counter-fires.

The state forests are all under the direction of persons equipped with proper technical education. The forestry officials commence with a stipend of 2,000 Lire, which is the salary of an Adjunct Sub-Inspector of Forests, and, ultimately, a compensation of 8,000 Lire, which is the salary of a Superior Inspector of the first class. The Sub-Inspectors have an allowance for travel of 250 Lire, and the Inspectors have an allowance of 400 Lire per annum. Persons employed in the forest service have the right to a pension after twenty-five years of service. The minimum pension is the half and the maximum four-fifths of the annual salary.

The highest functionary in the forest service is the Superior Inspector of the first class, with an annual salary of 8,000 Lire. The next in order are three Superior Inspectors of the second class, with a salary of 7,000 Lire, and two with a salary of 6,000 Lire. Scientific service in the forests of the State was introduced in the year 1869 with the founding of the Forestry Institute of Vallombrosa.

For scientific instruction in forestry there was created, in the year 1869 (inaugurated August 15th of said year), the Forestry Institute of Vallombrosa.

As late as the year 1909, young licenciates of the technical institutes and of the lyceums were admitted without examination, and those not provided with such license were admitted upon examination. But of these there were only ten who, at the end of the course, were licensed and nominated as Adjunct Sub-Inspectors of Forestry. Moreover, in the current year 1910, an identical course of rapid instruction has been instituted, and in the scholastic year just completed there are, also, actually ten purses of study granted. In Cittaducale was instituted by Royal Decree, twenty-fifth day of May, 1905, No. 250, a School of Silviculture for the forestry guards, the scope of which is to provide for the theoretical and practical instruction of the forestry guards of the various provinces of the Kingdom and of such persons as may aspire to similar employment. This school is attended by about twenty-five pupils. The course of instruction is completed in one year. It begins the first day of October and terminates on the thirty-first day of July.

From and after the year 1910, one of the two licenses will be required for admission to the course; for that of the superior institute physico-mathematical or land surveying, a previous examination upon the following topics: Mathematics, Physics, Chemistry and Natural History.

The course is one of four years, at the end of which the pupils are nominated Adjunct Sub-Inspectors of Forests with a salary of 2,000 Lire. The Minister of Agriculture, Industry and Commerce, at the end of the course, confers upon each licenciate the professional diploma of Forestry Expert. The institute admits into its course, also, foreigners who desire to acquire knowledge of the forest-flora of Italy. Upon an average there are thirty pupils that attend the course of instruction; that is, in the four classes taken altogether.

In 1909, in order to provide in the shortest space of time for completing with qualified persons the statutory roster of forestry officials, enlarged by virtue of the law of July 5, 1908, No. 375, a course of eight months for graduates in agricultural science and in engineering was instituted. In consequence, about twenty graduates in the agricultural course and one engineer were entered for the course.

NORWAY.

STATE FORESTS.

The extent of the public and semi-public forests, according to the latest returns, cover an area of 546,932 hektars of coniferous trees and 369,967 hektars of foliferous trees (almost exclusively birch), making together 916,899 hektars, estimated at a total value of Kr. 34,720,837, no consideration having been taken to rights of use (usufruct) connected with the forests. The average value of the woodland makes thus about Kr.37,86 pr. hektar.

The total expenditure in connection with the management and administration of the forests for the financial year 1904–1905 amounted to Kr. 644,700,53, while the revenue yielded by the forests during the same period was Kr.1,109,147,85.

Of the above expenditure, however, about Kr.190,000 were paid as grants to private forestry, purchase of woods and other objects, which do not concern the direct management of the public forests.

During the year 1904, 1,529,245 trees were planted out (chiefly pine, *pinus sylvestris*, and spruce, *abies excelsa*,) with which has been covered an area of about 3,058 hektars and 41,30 kilograms of seed have been sown over an area of 21 hektars at a total cost of Kr.28,883,61.

During the same year ditches have been dug in bogs and sour (seepy) ground and brooks cleared in a length of 91,142 running meters.

The regeneration is effected chiefly by natural seeding from the remaining trees and the mode of felling the trees is mainly on the basis of the selective cutting system.

The staff of the office for woods and forests consists of 1 Skogdirektor (director of forests), 4 Skoginspektorer (inspectors of forests), 26 Skogforvaltere (managers of forests), 1 Skogtaxator (valuer of forests), 4 Skogassistenter (forest assistants), 13 Skogplantere (forest planters) and 418 Skogvogtere (forest keepers). With exception of the forest keepers the whole of the staff is made up of men more or less thoroughly trained for this special line. On each of the "Skogforvalters" to whom the management of the public forests is entrusted, falls on an average 31,415 hektar. The distribution of the area is, however, very uneven.

There are no permanent laborers in connection with the forest and woods office of the State. Provided the trees from the public forests are not sold standing on the root, the felling and the conveyance (transport) of the wood is contracted for, while the planting and sowing, as well as the work in the nurseries, are carried out at daily wages, which as a rule are not higher than the earnings of ordinary day laborers (viz., about Kr. 3.00 a day). Where the forests are situated far away from inhabited places, cabins have been erected for the use of the laborers, and cottages for the staff.

The state has four great and several smaller nurseries, and for the drying of tree seeds two large and four smaller establishments which supply the necessary seed for public use and are also able to set apart a great portion for private consumption, especially of spruce seed.

In accordance with Section 3 of the Act of Storthing of July 20, 1893, rules and regulations for the protection of the forests have up to now been adopted in 77 districts,

and in accordance with Section 8 of said Act ordinary forest regulations in 37 districts, together 114 districts.

The majority of these regulations aim at prohibiting the cutting of trees under certain dimensions, still with the modification that cutting of trees not holding the proper measure is allowed in most cases where they have been selected by the overseer, who is paid by the district in question. The said Act of the Storthing is not considered to allow binding regulations for replanting and sowing of destroyed forests to be included in the above regulations.

In accordance with the Act of Storthing of July 14, 1893, with supplementary Act of July 27, 1896, regulations for the prevention and extinguishment of forest fire have hitherto been adopted in 164 districts. The regulations provide for compulsory attendance of able bodied men in case of forest fire. It has been found that these regulations have greatly contributed to limit the spreading of forest fires.

The State has a High School and two elementary schools which give instructions in forestry. Such instruction is also given by several agricultural schools.

PRIVATE FORESTS.

A society has been formed called "Det norske Skogselskab" (the Norwegian forest society) comprising the whole country with branches in 15 Amter (counties). The society has 18 nurseries and supports about 50 private nurseries. Two establishments for the drying of seeds are in operation. During the year 1904 the forest societies planted out about six million plants and sowed 415 kil. seed by which an area of about 1800 hektar of bare ground is considered to have been cultivated. During the same year ditches have been dug in bogs or in sour (seepy) ground and brooks cleared in a

total length of about 259,000 meters or 259 kilometers.

"The Norwegian Forest Society" publishes a journal for forestry, of which 5,400 copies have been printed and is published monthly. In addition thereto a review "Forstligt Tidsskrift" is published by two graduates in forestry for their own account, and which is published in quarterly issues.

In order to assist private people in the management of their forests, 11 Amtskogmestere (district inspectors of forests) have been appointed, whose salary and traveling expenses are defrayed, one-half by the state, whereas the other half is paid by the county in question.

PRUSSIA.

STATE FORESTS.

The extent of the state forests of Prussia is 7,403,022 acres. Included in this, however, are 790,345 acres not designed for tree culture. In addition, the extent of forests belonging to the Crown is 178,879 acres; belonging to municipalities, is 2,726,012 acres; belonging to churches, 241,990 acres; belonging to corporations, 583,979 acres; private forests, 10,376,956 acres, making an aggregate extent of 21,510,838 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to $700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1898 to 1908 per annum, $12,712,920. The annual aggregate revenue in the years 1898 to 1908 amounted to $24,952,182, being at the net rate of $1.85 per acre of actual forest. The average number of acres sown or planted with forest annually

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during the years 1898 to 1908 was 50,684. The number of acres newly planted in 1908 was 53,954. The age of the plants is from one to five years. They are planted in plots from 1.2 meters to 2 meters square, and at a cost of from 40 to 80 marks an acre.

The area of evergreen forests annually reforested from self-sown seeds is extremely small in comparison with the sections which are replanted either by seeds or seedlings. In the case of Scotch pine (*Pinus sylvestris*) and spruce, artificial regeneration by seeds or seedlings forms the rule. Natural regeneration prevails in the case of the silver fir (*Abies pectinata*) and the beech, though with both species artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. In regard to the continuity of forest products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875, the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1897 to 1909 was as follows: Totally or mostly destroyed, 1,503 acres; only slightly damaged, 80 acres; only the surface destroyed, 689 acres. The average annual number of forest fires in the years 1897 to 1909 was 22, the causes of which were as follows: 11 unknown, 2 railroads, 2 incendiary, 6 caused by carelessness, 1 lightning. During the years 1897 to 1909 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The

foresters have clerical rank. The salary of "Oberfoerster" (district manager) ranges, according to length of service, from 3,000 to 7,200 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 300 marks annually. In addition, there is usually free residence and fuel, and allowance for contingent expenses not exceeding 3,900 marks. The salary of the "Oberfoerstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberfoerstmeister" is allowed an amount not exceeding 4,000 marks for traveling expenses, the "Forstrath" an amount not exceeding 3,000 marks. The "Oberfoerstmeister" receives furthermore 1,200 marks additional compensation for administrative supervisory services. One-third of the number of the councillors ("Forstrath") receive 600 marks each additional in consideration of the location of their official posts. The "Oberfoerstmeister" and the councillors also receive an amount not exceeding 1,200 marks for residence.

The Prussian Chief Forester, with a salary of from 14,000 to 17,000 marks, with 2,000 marks for residence ("Oberlandfoerstmeister"), and five State Chief Foresters ("Landfoerstmeister") with a salary of from 7,000 to 11,500 marks and 1,600 marks for residence, are at the head of the state forestry administration.

The right to a pension matures for all officers upon the expiration of the 10th year of service. The pension is at the rate of one-third the salary, increasing in time to three-fourths the salary.

The average size of state forests placed in charge of a scientifically trained forester amounts to 9,830 acres. Within the entire state forests, during the year 1908, there were employed 173,597 workmen (and workwomen) working on 10,448,440 work-days. In other words, there have been employed, per 1,000 acres of state forests, 23 workmen (and workwomen) engaged on 141 work-days.

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The workmen obtain a sufficient wage scale. In order to attach the workmen and their interests to the forest, a number of small farms are being leased to them at a cheap price. Within the entire state forest administration of Prussia, there are kept, altogether, 870 houses for forest workmen, containing 1,819 dwellings.

There are two Forestry Academies, designed for instruction for students preparing for the forest administration service. These academies are at Eberswalde and Münden, Hannover. There were 79 students at both institutions during the summer term, 1909, and 97 students during the winter term, 1909-10. These students all taking courses of instruction with a view to entering the Prussian Forestry Service. Besides these there were 121 guests, or special students, during the summer term, 1909, and 134 such during the winter term 1909-10.

There are four Forestry Schools, preparing for the forest protection service; the aggregate attendance from October 1, 1907, to October 1, 1908, was 195.

Observations as to the influence of forest upon climate and rainfall are still in progress.

PRIVATE FORESTS.

The area of the private forests of Prussia, as above stated, is 10,376,956 acres.

About 50 per cent of the private forests are managed on forestry principles. This proportion does not relate at all to hereditary estates.

In eastern Prussia level country with sandy or clayish sandy soil prevails; in western Prussia the country is mostly mountainous.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other

Part of Lake Saganaga. An exceedingly beautiful lake, about 12 miles in length, on the northern boundary of Minnesota, and forming a part of the northern boundary of the Lake Superior National Forest.

Spruce and pine plantation seven years after setting out on a deserted field in Germany. American white pine in foreground, with white paper in it to keep off the roe deer.

in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of $1.85 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

RUSSIA.

STATE FORESTS.

At my request the then American ambassador at St. Petersburg, Mr. Riddle, kindly furnished me information on forestry in Russia. It is probably not generally known in this country that scientific forestry was introduced in Russia as early as 1820; and that a school for scientific instruction in forestry is maintained at St. Petersburg attended by 565 students. For the support of this school the Russian government expends annually $93,250.50, and the students $17,643.50. Besides, there are in the empire 32 lower grade schools for forestry instruction with 580 students. The state forests comprise the enormous

area of 634,143,918 acres, the merchantable timber on which is sold under sealed bids. The expense of administration averages about $5,570,773 annually. The revenue in 1904 amounted to $24,650,278. Selection cutting is mostly practiced. In 1905, 21,241 acres were artificially planted and 126,052 acres started for replanting. The forests at present are under the charge of 1,237 scientifically trained foresters.

The following are the questions I submitted and the answers that were furnished:

Question 1.—Area of the productive state forests of Russia, character of surface and soil and prevailing kind of trees? Area:—

Siberia	102,600,000	acres.
Caucasus	19,353,918	"
Russia in Europe	461,700,000	"
Finland	50,490,000	"

Soil:—Generally sandy-clay.
Species:—Pine, fir, oak and birch.

Question 2.—Average number of feet of timber annually cut therefrom; average age of pine when cut and diameter breast high at such age?

No accurate reply can be made to the first part of this question, as the acreage of all the forest land in the empire (especially in Russia in Asia) is unknown; there is likewise no information relative to the mass of trees cut each year on private forest estates, the acreage of which in Russia in Europe amounts to 108,000,000 acres. In view of this only the amount of timber obtained from state forests can be given. The Report for 1905 shows that out of 286,427,665 acres of state forests in Russia in Europe 4,802,412 cubic fathoms (7 feet) of timber were cut from 229,532,232 acres; about 22 per cent of this amount was received from the forests of Northern Russia, namely, the provinces of Archangel, Vologda, Perm Olonets and Viatka, covering an area of 247,702,139 acres, which in 1905 yielded 1,062,304 cubic fathoms of timber. Furthermore, in the Caucasus, 13,418,327 acres of state forests, with good forest land covering 8,454,607 acres, yielded 132,463 cubic fathoms of timber, and in Russia in Asia 361,945,497 acres of forests belonging to the state, of which 129,169,881 acres are good forest land, yielded 607,595 cubic fathoms of timber. Thus all the state forests in the empire, covering 661,792,491 acres, yielded in 1905, 5,542,470 cubic fathoms of timber.

With regard to the average age of pine when cut, this can only be approximately defined, according to the manner in which the forests are cleared, namely: whether the whole forest is cut down or whether only chosen trees are cut.

Generally in Russia in Europe the age of the trees felled is: for pine, from 80, 100, 120 and 150 years; for oak, 60, 80, 100, 120 and 150 years; for fir, 60, 80 and 100 years. For private forest landowners the forestry laws are applied, and the age for oak is 40 years; while that of other leaf trees is fixed at 30 years. The forests mortgaged in the Nobility Land Bank enforce in European Russia, in the North, the age of 100 years; in Central Russia, 80 years; in Southern Russia, 70 years; for oak 120 to 80 years, when bad growth, 40 years; for birch, poplar and alder, from 30, 40 to 50 years. In the state forests the age for cutting is fixed: for oak, from 80 to 120 years, and for other species, from 40 to 60 years.

With regard to the diameter of trees cut, an average cannot be properly given, as it varies so greatly, in view of the age, degree of intensity of the growth, local requirements, etc. In properly managed estates, the trees cut have dimensions from 1¾ to 17⅛ and 26¼ inches. In

Northern Russia the diameter of coniferous trees, the pine and fir tree, sent to the market at Archangel and obtained from the provinces of Archangel and Vologda, varies from 14 inches to 15¾ inches breast high, while trees of 21 inches and even 26¼ inches in diameter are found. The average diameter of oak trees is also difficult to establish, but it may be fixed at 15¾ to 21 inches, while gigantic oaks are found having from 43¾ to 52½ inches in diameter breast high.

Question 3.—Explain briefly the way in which the state sells its standing timber?

Notwithstanding the growing importance which the exploitation of forests has taken in Russia it rarely occurs that the proprietors manage their own estates; the forests are generally divided into small lots and sold to the highest bidder. The sale of forests belonging to the Domains and the Imperial Cabinet are generally advertised for sale, six months in advance. The bidders present their offers in sealed envelopes which are opened on a day fixed for this purpose in their presence. They may make bids for a number of lots or for the whole forest, depositing from 10 to 20 per cent of the contract value as guarantee for the proper execution of the contract.

The party who has made the highest bid receives the permit to cut the trees, and, if he deposits the entire value of the contract, he receives the permit to carry away the timber. The trees are cut down for the most part in Russia from October 28th to March 28th. Hand labor is abundant in the north of Russia, where forestry constitutes the main resource of existence of the population, as well as in the central and western provinces, where the peasants have no other winter labor. Labor is paid by tree or beam or rafter, or by the fathom for wood to be used as fuel. The average day costs from 45 to 50 copeks

(22½ to 25 cents) per laborer in the basin of the Vistula, while it becomes less, being 20 cents per day in the eastern provinces, and runs up as high as 35 and 45 cents per day in unpopulated districts. Generally the laborers form themselves into an "Artel" or association having a "starosta" or "senior" at the head, which directs the work and acts as intermediary between the agents and laborers.

Question 4.—What is the annual expense of administering the state forests, and does such expense include forestry instruction and the purchase of additional lands?

The expense of administering the state forests including expenses of forestry instruction amounted in 1904, and is about an average, to $5,570,773.

Question 5.—Amount of annual revenue?

The revenues from the state forests in 1904 amounted to $24,650,278.

Question 6.—Is clear cutting or selection cutting mostly practiced?

In state forests selection cutting is mostly practiced.

Question 7.—About what proportion of cut over land becomes reforested by natural seeding and what by artificial planting or sowing?

The report of state forests for 1905 shows that the state, when it sells its forests to private parties for exploitation, receives from the purchaser a pecuniary guarantee for the proper and full exploitation of the contract. And these sums when not returned to the contractors on account of improper fulfilment of their contract, form a fund used in reforesting or planting forests. Thus in 1905 from the sums thus obtained and from credits obtained for that purpose: (a) 21,241 acres were artificially planted; (b) 7,290 acres of planting were finished; (c) 126,052 acres were started for replanting; (d) 105,799 acres were worked at, and (e) 38,383 acres already planted received supple-

mentary work. In forest lands belonging to private owners in Russia in Europe out of 39,906 acres 32 per cent were replanted and 68 per cent sown.

Question 8.—How many acres are annually planted?

The answer to this question was included in No. 7.

Question 9.—What is generally the age of the plants; how many feet apart are they planted; how many men, women or children does it take to plant an acre per day and at what expense?

The age of the plants which are transferred from the nursery devoted specially to the cultivation of various kinds of trees, is as follows: the pine, generally from one to two years of age; the fir, 2 to 3 years old; the oak, from 2 to 3 years old; other leaf trees from 1 to 2 years old.

The method of planting pine and fir trees in Russia is in squares, the trees being planted in rows, the rows and trees being 42 inches apart. The forests are also planted in rows 56 inches apart, the trees therein being 28 inches apart. In the first instance 9600 young trees are planted on 2.7 acres, and in the second instance 2.7 acres contain 10,800 trees. Oak and other leaf trees are planted in rows 56 inches apart, the trees being 28 inches apart.

The cost of this work depends upon many conditions: the quality of the soil, the degree of readiness of the soil, the distance of the nurseries from the ground to be planted, therefore it is preferable to give several instances which characterize the amount of labor required. These instances have been chosen from reforesting effected in the province of Voronege (Central Russia).

1.—The planting of pine trees in sandy and sub-sandy prepared soil, 1 to 2 year trees in rows 56 inches apart and 28 inches distance between trees, placing one or two trees in each hole, transported over a distance of from ⅔

to 5⅓ miles; including the digging of the holes, the force employed per deciatine (2.7 acres) was: for laborers with horses 0.35 to 0.40; for laborers without horses from 3.5 to 3.6, and for women from 2.5 to 2.9.

2.—The planting of pine, same soil as above, in furrows ploughed out 42 inches apart, digging up the young trees and transporting them over a distance of from ⅓ to 2 miles; digging holes with spades in furrows and planting the trees, the force expended per deciatine (2.7 acres) was: for laborers with horses 0.65 to 0.90 and for common laborers without horses 2.9 to 5.9 and women from 8.6 to 15.2.

3.—Planting 1 to 2 year old oak trees at the rate of 1200 per deciatine (2.7 acres) in firm soil (black clay), one or two trees in each hole dug out by spade, each hole being 6 vershoks (10½ inches) deep, the force expended was: men with horses from 0.12, men without horses from 1.3 to 4.5 and women from 12.5 to 13.8.

4.—The planting of 1 to 2 year old oak, 400 to the deciatine (2.7 acres), cost force per deciatine: laborers with horses 2.9, without horses 8.8 to 12.0 and women 5.8 to 6.2.

The planting of trees in the black soil steppes of Southern Russia, at the rate of 10,800 trees from 1 to 3 years old per deciatine (2.7 acres), requires about 1 man with a horse, 10 men without horses and 12 women.

With regard to the cost of the above named work, it varies greatly according to the price of labor in the different localities. In the province of Voronege the cost of labor is from 50 to 75 cents per day for a man with a horse; 20 cents for men without horses and from 15 to 20 cents for women.

Question 10.—Annual amount of damage by forest fires? Means taken for preventing and extinguishment of forest fires?

In 1904 the amount of damages in the forests by fire and other reasons, was as follows:

Loss caused by fire	$84,930.50
Loss caused by insects	24,068.50
Loss caused by floods	1,039.50
Loss caused by snow storms	10,098.50
Loss caused by wind	33,147.00
Loss caused by other reasons	6,566.00
Total loss	$159,852.00

The means taken for preventing and extinguishment of forest fires is not stated.

Question 11.—Number of persons annually employed in the state forests and average number of days in a year; and about what number of them reside in or near the forests?

In reply to the first portion of this question it is necessary to state that nearly all the lumber obtained from the state forests is used either for the requirement of the peasant population or is sold by auction, so that both the peasants and contractors work the forests with their own laborers; on this account the Forestry Department does not employ laborers for the state forests, and when it does employ laborers it is for timber required for its own use (valued of about 2½ million dollars per annum), as well as for reforesting purposes.

The second portion of the question is so indefinite that it is difficult to give a reply. If this question is made in order to ascertain the relation between the forest area and population in various parts of the empire we then refer to the information on this subject contained in the copy of the "Forests of Russia," edited for the Universal Paris Exhibition in 1900. (This book has been forwarded.)

Questions 12 and 13.—On an average how many acres are under the supervision of a scientifically educated for-

ester? What is his pay and allowance? After how many years service does he receive a pension and at what rate? Also: What is the title, rank and pay of the highest class of forest officials?

If the first portion of this question refers to the average number of state foresters employed in Russia, the reply is included in the Forestry Report for 1905, namely: 1237 foresters, of which 996 in Russia in Europe, 87 in the Caucasus and 154 in Russia in Asia. The area of the forests under their control would be as follows: In the north of Russia in Europe, the average area of forestry would vary from 2,970,000 acres in the province of Archangel to 245,592 acres in the province of Viatka, while in the Caucasus the area is, for instance, 147,420 acres, and in Russia in Asia 2,430,000 acres.

Foresters are divided into two categories (I. Class and II. Class). Forest Inspectors into "Seniors" and "Juniors". The duties of the latter are to inspect and control from 2 to 4 foresters in their district. At present the majority of crown foresters have acquired the highest forestry instruction, and the average number, lower instruction. Inspectors have assistants which have obtained the highest degrees in forestry. In 1905 there were 253 assistants and 1386 forest "conductors" or guides.

The pay of local foresters serving the crown varies according to the condition of their duties and may be expressed as given below:

Senior forest inspectors			$1250.00
Junior forest inspectors			1075.00
Foresters I class	from	$725 to	875.00
Foresters II class	from	600 to	750.00
Assistant foresters	from	275 to	400.00
Forest guides	from	200 to	350.00

These amounts include from $75.00 to $250.00 for expenses of displacement.

With regard to pensions it must be said that they have to serve 35 years, but a portion of the pension is granted to persons who have served less time, according to categories: up to 15 years, from 15 to 25 years and from 25 to 35 years.

The amount of pension they receive is worked out as follows: ¼ of their pay when they have served 15 years; ⅓ when they have served from 15 to 25 years, ½ for 25 to 35 years' service, and ⅔ of their annual pay for 35 or more years' service.

The rates of pensions for 35 years' or more service, are fixed as follows:

Senior forest inspectors	$600.00
Junior forest inspectors	500.00
Foresters of I class	400.00
Foresters of II class	350.00
Assistant foresters	200.00
Forest guides	125.00

It must be remarked that according to the laws in force foresters (as well as inspectors) and their assistants have the special privilege of receiving land, the proportion being from 81 to 121½ acres for foresters and inspectors and 40½ acres for forest assistants. Besides, many foresters, inspectors and their assistants receive dwellings in houses belonging to the Government and purposely built for them; those who do not receive free dwellings are made a special allowance therefor. Fuel is granted to all in proper quantities.

Question 14.—When was forestry first introduced into the management of state forests?

In 1820.

Question 15. — What are the colleges or schools for scientific forestry instruction and aggregate number of students attending; also, number of forestry schools of lower grade and number of students attending?

There is, so far, only one college for scientific forestry instruction, which is known as the "Institut du Corps Forestier" in St. Petersburg, which had last year 515 students on January 1st, this number was increased during the year by 169 more; 64 students graduated and 55 left for various reasons, thus on January 1, 1907, there were 565 students as follows: 181 in the I class, 154 in the II class, 127 in the III class and 103 in the IV class. The whole course lasts four years. The maintenance of this college costs annually $110,894, of which sum the government pays $93,250.50 and the students $17,643.50.

Besides, there are 32 lower grade schools in both Russia in Europe and Russia in Asia, with 580 students. At the beginning of the present year 1162 students presented themselves but only 255 were accepted. The maintenance of these schools costs the government $78,827.00.

GRAND DUCHY OF SAXE-MEININGEN.

STATE FORESTS.

The area productive of woody growth is 110,900 acres. The state forests are situated in a mountain range called the "Thüringer Wald" and in a hill country abutting on it where the underlying rock is red sandstone of the trias, shell limestone and keuper-limestone. The prevailing species of forest trees are: Spruce (*Picea excelsa*), pine (*Pinus sylvestris*), fir (*Abies pectinata*), beech and white oak.

In 1908, the yield (cut) of the state forests was 33,800,000 feet board measure, or 4,765,000 cubic feet.

The rotation for pine is from 100 to 140 years (averaging 110 years); at that age, the diameter of the trees 4½ feet above the ground is 12 to 16 inches (average 13 inches). The rotation for spruce is 90 to 110 years (averaging 105 years); at that age, the diameter of the trees, measured as above, varies from 12 to 15 inches.

The smaller branches and the tops of the conifers are used for fuel; the pine needles are used for litter in the stables.

The Department does not sell any standing timber. The trees marked by the forester are cut into logs or worked into cordwood at the expense of the state and are sold from the woods by public auction to the highest bidder.

Is it the avowed policy of all German states to buy for the state neglected farms, abandoned fields, maltreated forests, unproductive, swampy stretches, or sand barrens, with a view to returning such land to productiveness by forestry. Waste land owned by towns the government foresters try to have restored to tree growth.

Clear cutting as well as shelter wood-compartment cutting is in vogue About three-fifths of the second growth is being obtained by planting, and the remaining two-fifths are supplied by natural seeding. In 1908, there were planted in seedlings (after clear cutting), 957 acres. The age of the plants used for planting is: In case of spruce, 2 to 4 years; pine, 1 to 3 years; fir, 3 to 5 years. The planting distance is, for spruce and fir, 4 feet 4 inches square up to 5 feet square; for pine, 3 feet 4 inches square. Usually the plantations are made under contract, at an outlay averaging $12.50 per acre.

The damage inflicted upon the forests by forest fires is small; it can not be estimated to average more than $125 per annum. Preventive measures are: Raising of mixed stands; proper supervision by watchmen; rules prohibiting the smoking of pipes, cigars or cigarettes in the woods; fire lanes, kept free from vegetation. Remedial measures are: Isolation of a burning woodlot from the woodlots adjoining by ditches or strips raked clean; beating the flames with a brush-switch.

In 1908, 1,004 individuals were employed, residing in the villages close to the forests.

All state forests are placed in charge of foresters of scientific training. Their salaries are: For "Superior foresters" (supervisors), $600 to $1,050 per annum, plus $75 to $150, paid toward living expenses. For rangers (inferior staff), $300 to $600. The highest officials in forestry perform the functions of counselors in the Department of State. Their salary is from $1,000 to $1,750.

The foresters receive their scientific training outside this state, at universities and forest schools belonging to other and larger states of the empire. There exists a ranger school (for the inferior staff) in this state. To it three new students are admitted annually.

PRIVATE FORESTS.

The majority of the forests privately owned consists of small and very small parcels. There is a relatively small number of family forests (entailed). The woodlots privately owned are found partly scattered and partly in compact bodies.

The total area of the private forests in this state is 63,250 acres. About 10,750 acres are forming parts of estates of larger size. The management of these forests does not always correspond with the tenets of strictly conservative forestry.

The taxation is based, on forest land as well as on farm land, on the estimated net acre-yield obtained in an average year.

The consent of the Secretary of State is required for the subdivision of woodlands as well as for their change into farms. The owners of woodland are held to reforest, after clean cutting, within a space of time fixed by law.

The supervision of private forestry is left with the state government acting through the Superior foresters and through the so called "Superintendents of Private Forests." Statistical records are kept at headquarters showing the acreage of woodland privately owned.

Aside from state forests and of private forests, there are situated in this state 88,425 acres of woodland belonging to towns, religious institutions and corporations, and 2,367 acres of woodland belonging to other states (e. g., Prussia, Saxe-Weimar, etc.)

As regards the town forests and those owned by institutions and corporations, the following remarks are pertinent:

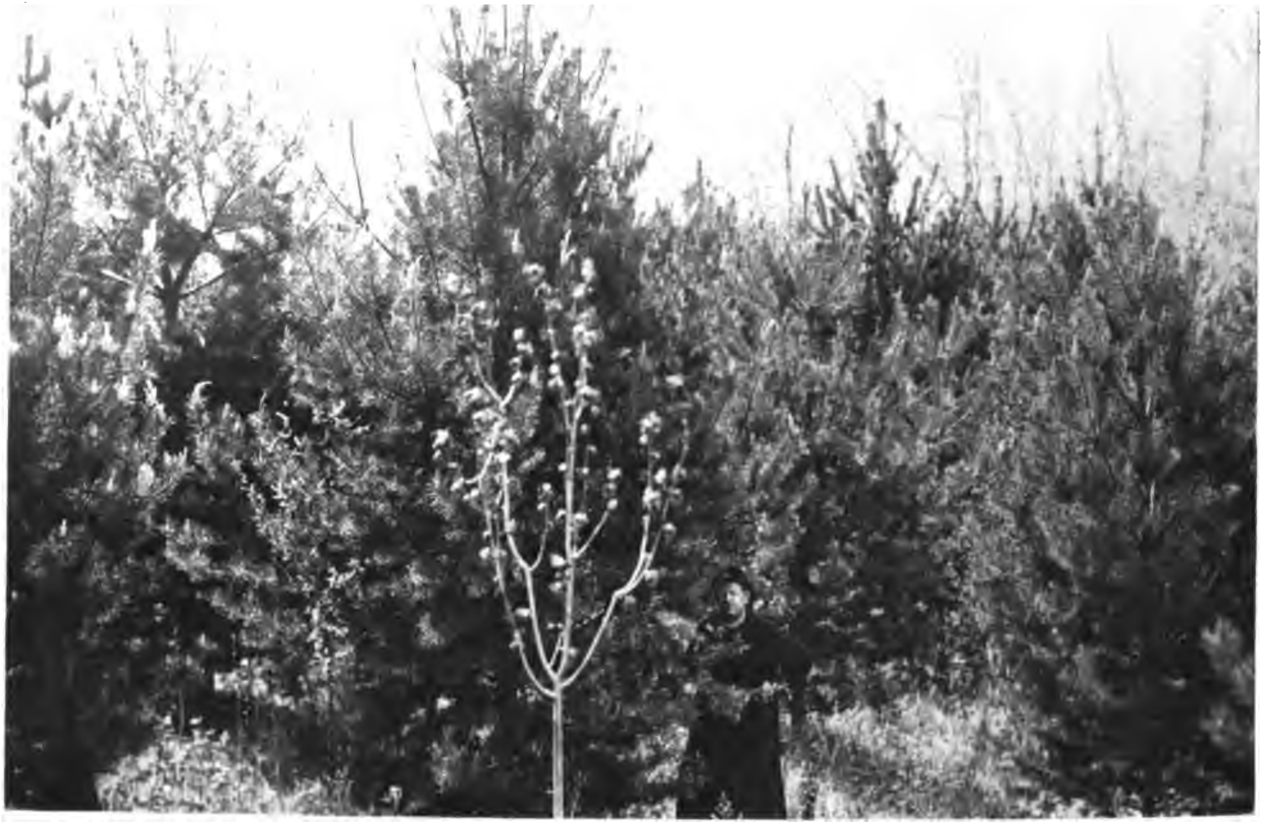
The cut was, in 1908, 10,800,000 feet, board measure (1,517,500 cubic feet). No standing trees (stumpage) are sold in these woods. The trees are either felled, cut into logs or cordwood, and then sold by public auction or directly to interested parties; or else the trees are felled by the citizens (villagers) enjoying a prescriptive right or an easement over the forest. In the latter case, the persons entitled obtain the wood either free of charge or against a fixed price per unit.

The average net revenue per acre is $4.69, ranging between 56 cents and $6.68 per acre for the various districts.

The reforestation of cutover land is, by natural seeding, two-tenths; by artificial regeneration, eight-tenths; these proportions are estimated.

In 1908, 772 acres were planted in seedlings, and 86 acres planted in seeds. The planting distance is: For spruce and fir, from 4 feet by 4 feet up to 6 feet by 6 feet for pine, from 32 inches by 32 inches up to 40 inches by 40 inches; also 48 inches by 20 inches. The average expense is $22.21 per acre.

The 27 managers of these forests are men of technical and scientific education; there are, however, also some former rangers who have risen from the ranks to the position of manager. The salaries are varying.



Planted pine on the grounds of St. John's University, Collegeville, Stearns County, Minn.

The state government is about to offer a bill pertaining to a systematic change of the mode of employment for foresters in charge of town forests, institution forests and corporation forests.

The rangers and the forest guards are recruited from all sorts of professions. For most of them, the duties of a guard are a side Issue.

The highest official connected with these forests is the same man mentioned as the highest authority for state forests.

SAXONY.

STATE FORESTS.

The aggregate area of the state forest is 448,900 acres, of which 18,200 acres are in farms, grass meadows, etc. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,637.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 235,000 acres. The second group, in the outskirts of the Erz mountains and in some smaller distinct mountain ranges, comprises 113,000 acres· and the third group, in the plains, comprises 94,000 acres. The soil consists of decomposed granite, granulite, gneis; mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus sylvestris* (L.); silver fir, *abies pectinata* (D. C.); larch, *larixeuropæa* (D. C.); rotbuche, *fagus silvatica*

(L.); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L.), *a. platanoides* (L.); further, several species of elm, *ulmus;* of birch, *betula;* and of linden, *tilia.* The prevailing species is spruce, comprising 80 per cent.

The yield (cut) of the state forests in the year 1908 (wood and timber of over 3 feet diameter) was, in feet board measure, 226 million, or, expressed in cords, 361,500 cords, or, expressed in cubic feet, 31,910,000 cubic feet. In this total are comprised 83 per cent of wood and timber fit for technical use, and 17 per cent of firewood.

The age of final maturity, beyond which the trees are not allowed to remain, is; For spruce (*picea excelsa*), 80 years; for pine (*pinus sylvestris*), 80 years; for all hardwoods, 120 years.

The diameter of the trees measured with the bark at 4½ feet from the ground at these ages depends entirely on the quality of the soil; it varies, for spruce, between 8 inches and 10 inches; for pine, between 6 inches and 10 inches.

The yield of tops and branches under 3 inches diameter was, in the year 1908, all together, 230,000 cords, of which 27,700 cords were used by the industries, the balance of 202,300 cords being sold for fuel.

Public sale of logs and of wood (cut at the expense of the Department) at auction to the highest bidder forms the rule.

The entire gross expense for forestry in 1908 was $1,554,400. In this is included the outlay incurred for the Working Plan Division. The above aggregate is composed of: $622,900 for salaries, etc., $282,000 for planting, road building and other improvements, $649,500 for logging (also workman's insurance, forest experiments, etc.)

The summary given ($1,554,400) does not include the outlay for purchase of additional forest lands, nor does it comprise the expense incurred for forest education

The entire gross revenue from forestry in 1908 was $3,942,400. The net revenue was, as a consequence, $2,388,000, equal to $5.32 net per acre; and equal to $6.65 net per cord (stumpage), or equal to $10.13 net per 1,000 feet board measure (stumpage).

The investment in forestry forms a grand total of $94,040,000. The rate of net interest derived from it is $2½ per cent

The clear and clean cutting of mature stands forms the rule. The gradual removal of a stand by selection cuttings is exceptional and rare, being applied almost exclusively to beechwoods.

The regeneration of a stand from self-sown seed is practiced only on very small areas, in the case of stands of mature beech. The area annually reforested after cutting varies, according to the requirements and according to the areas bared from trees acquired by purchase from private owners. On the average, the area annually replanted in a systematic way comprises 5,750 acres. In 1908 there were reforested 182 acres by seeds planted, 5,747 acres by seedlings planted; total, 5,929 acres. The average age of the seedlings used for reforestation is, in the case of pine, 1 year; in the case of spruce, 2 to 5 years.

The expense per acre, reforested (including all nursery work, etc.), averaged, in 1908, $14.60. The work is not done by contract; it is done by day work, the wages of laborers per ten-hour day being, in planting work, for men, 70 cents; for women, 40 cents; for children, 25 cents.

Forest fires are relatively rare and not extensive. In 1908, seventy fires were reported, destroying 18½ acres of plantation, at an estimated total loss of only $550. The expense incurred for extinguishing the fires was $182 only. The majority of the fires are due to carelessness of visitors (throwing away matches or cigars) and to locomotive sparks. The latter danger the Department seeks to avert by establishing safety strips along the lines of the railroads.

The Forest Department gives employment to 15,000 individuals, working, in the aggregate, on 1,344,800 work days. 4,600 workmen, more or less continuously employed on 1,048,700 work days, notably in logging and other heavy labor, are "staff-workmen;" the balance of the individuals are given temporary employment during the planting season, or at roadwork of an unusually large character. All of the forest workers reside in villages in the immediate proximity of the forests in which they are employed.

The area placed in charge of a state forester (supervisor), trained practically as well as scientifically, averages about 4,000 acres. The state forest is subdivided into 109 such districts, each of which is independently administered by a state forester who is called "Superior Forester," and who draws an annual salary varying from $900 to $1,800. The position allows of an additional $500 per annum for traveling expenses (including horse keep) and office expenses, and of an additional $75 toward house rents. Prior to 1908, the officer was provided with a house free of charge. Since that year, he pays from 10 per cent to 12 per cent of his salary by way of house rent. The pension right of a state forester begins after 10 years, reckoned from his first employment. The pension comprises from 30 per cent to 80 per cent of his salary, the amount depending on the duration of past employment. The highest figure (80 per cent of salary) is allowed after 40 years of active service.

The 109 forest districts mentioned are allotted to nine "inspections," each of which is headed by a "Superior Forest Master," whose annual salary varies from $1,650 to $2,325, plus traveling expenses of $825, and plus allowance toward house rent of about $75 per annum. Prior to 1908, the officer was entitled to the use of a house free of charge; since 1908, he pays from 12 to 18 per cent of his salary for house rent. The nine inspectors report to the Secretary of Finance. One member of the Secretary's Council is a forester bearing the title, "State Forest Master."

The beginning of a systematic and regular management of the state forests in Saxony coincides with the beginning of the 19th century. From the middle of the 16th century on, however, the state authorities have progressively prevented (by so-called "forest ordinances" and by a forest police staff) the absolute devastation of the woodlands, establishing certain rules tending to secure, in the long run, some sort of forest management.

The state foresters (alias "Supervisors" or Superior Foresters") receive a scientific training, after a year's course at a university, at the technical school of forestry at Tharandt, Saxony. During the summer months 48 Germans and 45 foreigners were studying at Tharandt.

The forest rangers (guards) obtain a merely practical training during three years of apprentice work under a "Superior Forester." There do not exist in Saxony any "forest ranger schools."

The goal of forestry in the state forests of the Kingdom is this: "The highest net dividend must be obtained from every acre of forest soil; or (which is the same), the highest possible rate of revenue must be obtained from every dollar invested in forestry."

This demand for the application of purely "business methods," or financial methods, in state forestry was first made in 1858 by Professor Max Pressler, one of the teachers at the State Forest School at Tharandt. Since 1867, his teachings have been introduced into the practice of forestry, with the result that the "rotations" have been shortened, and that stress has been laid on the reproduction of softwoods in preference to hardwoods.

PRIVATE FORESTS.

The aggregate area of private and municipal forests in Saxony in 1900 was 520,000 acres, and these are the latest statistics of their area.

The forests of larger size, and notably those owned by towns, by religious or charitable institutions or by families (under entail) are usually well managed, according to the tenets of modern forestry. The forests of small size privately owned (farm woodlots) are irregularly managed, without system or rule.

The reasons for this deficiency are simply these: Forestry of a conservative type cannot be practiced successfully unless the forests are fairly large and compact. The owner of a small woodlot is a relatively poor man, usually; he is unable to make any investments tending to increase the productive capacity of his holdings only in the long run, and without yielding immediate returns by way of dividends or reimbursements.

TAXATION OF PRIVATE FORESTS.

Private forests are taxed in the same manner in which private farms are taxed. In both cases, taxes are levied according to the actual net revenue obtained per acre during the last three years.

Private forests proper are free from any state-governmental supervision or interference. The town forests, however, are subject (like all other property of the towns) to the general supervision of the general public administrative officers (id est, they are in no way supervised by the forestry department; they are supervised by the state department, in a general way).

GRAND DUCHY OF SAXE-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres; in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working Plans," at Eisenach, the director of the forest academy being at the same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property; maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintainance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

SPAIN.

For the answers herewith I am indebted to Hon. Henry C. Ide, American Minister to Spain.

STATE FORESTS.

The forest area considered available for public purposes in Spain is as follows: Belonging to the state, 243,229 hectares, to municipalities 4,672,029, and to public institutions 6,542 total, 4,921,800 hectares, or 12,161,767 acres. In all of the foregoing reservations the state forestry service has supervision and they are subject to forestry regulations. According to methods of improvement, they are classified as: high mountains, 2,154,584 hec., low mountains, 1,248,951 (the first called in French Futaic and second Raillis), and 3* mountains covered with bushes and herbaceous plants, 1,518,265 hectares.

The different kinds of trees covering the first two named mountains are: Pine, 7 species, fir (*abies pectinata*), beech, oak (5 species of oak), ash, maple, birch and alder. These mountains ,as well as those covered only with a growth of bushes and herbaceous plants, are found mainly among the higher ranges of the Pyrennees, Cantabrian Pyrennees, Iberian and Guadarrama mountains, Gredos and Gata, the Sierra Morena, Sierra Nevada, mountains of Toledo, the more arid portions of La Mancha and the sandy plains and bleak wastes of the high central tablelands of the Peninsula. The soil is completely denuded in the large level tracts and bare spots not protected by trees which disappeared due to irregular exploitation in former times.

Each year the average cut is about 160,254 cubic meters of wood, equivalent to 5,723,359 cubic feet, English. Pine is cut ordinarily at 100 years, having at that age an average diameter of 45 centimeters. Hemlock (*abies excelsa*) is not found in large tracts in Spain. The cuttings of the trees (tops and branches) are used for fuel.

Both in the forests belonging to the state and those belonging to municipalities the amount of wood to be cut is fixed annually according to reports furnished by the Inspector for each district and approved by the Minister of Fomento. Once this approval is obtained the engineers in the different districts proceed to mark the trees with the official seal and gauging the same. If the number of trees is considerable and they are situated at different spots far apart, they are divided into lots and bids asked for separately according to the corresponding administrative and technical conditions. In the cutting, the transportation, etc., the engineers are in direct and continuous charge, to prevent abuses and excesses.

The total annual cost of the forestry service for the past decade, including the expense of technical personnel and rangers, instruction in forestry and replanting of higher river valleys and acquisition of private lands, has been 4,892,681 pesetas, or $944,287 (a peseta equals one franc, or $0.193).

The amount of annual receipts in the last decade has been 9,032,618 pesetas, from all sources. This is a low figure which is not explainable except on the ground of the desolate condition of the forests in Spain which make necessary a large amount of reclamation work. The yield per hectare is 1.54 pesetas. In the forests which are under scientific care, and which are those in the best condition, this yield per hectare is 7.34 pesetas. Calculating the capital represented by all of the public forests of Spain, the annual yield is 1.83%.

In the forests containing tall trees the cutting is done by selection or by reproduction through successive clearings. In the lesser growths the timber is many times entirely cut off as the new growth is assured from the sprouts on the stumps.

In all of the forests the cut areas are replanted almost entirely by natural seeding.

Artificial replanting, as also the work of controlling the streams and fixing seacoast dunes, are entrusted to the following branches of the Forestry Hydrologic Service: 1. Lower Cuenca, Ebro and Eastern Pyrennees; 2, id., Jaen; 3, id., Seguro; 4, id., Tajo; 5, id., Guadalquiver and other rivers of of the district of Malaga; 6, Middle Cuenca, Ebro; 7, Upper Cuenca, Ebro and (8) Guadarrama; 9, Canaries.

Since the year 1910, in which they were created, the plans for reforesting, restraining streams and placing dunes embrace about 124,988 hectares, and the work completed 12,614 hectares. The disproportion between the work done and the work contemplated is due to lack of funds available for the hydrologic and forestry service.

The age of the plants upon transplanting is generally from one to two years in the coniferous, in those of the plain leaved varieties two years and in some kinds of oaks four years. In each hectare there are set out from six to eight thousand plants and usually in groups of two each. To plant one hectare per day, from 30 to 35 men are needed. The wages of the workmen range from 1.75 pesetas (Murcia) to 2.50 pesetas (Cataluna); women receive 1.50 pesetas and children 1.25.

The annual loss by fires is placed at an average of 253,000 pesetas. The means employed to prevent them are the opening of fire cuttings among the heaviest of the coniferous growths and along the railway lines. To extinguish them promptly once started a flying brigade is formed during the summer among the operators and a system of rapid communication established by means of signals.

As the work on the state forests is done almost wholly by contract, the forestry service has no data available as to the number of persons employed in the state forests.

At present each ranger has to look out for about 4,000 hectares, but in view of the impossibility of properly taking care of such a large tract, the government plans to increase the ranger service sufficiently to properly care for this work.

The rangers are of three categories: Guarda mayor, or head guard, receiving 3.50 pesetas per day; sobreguarda or second guard, receiving 3 pesetas per day, and peon-guarda or laborer guard, receiving 2.25 pesetas per day. Whatever their length of service, they have no right to a pension. The highest rank in the corps of foresters (Cuerpo de Inginieros de Montes) is that of Inspector General, ranking as a bureau chief of the first class, with an annual salary of 10,000 pesetas.

The principles of forestry culture were introduced in the service in Spain in 1855.

The only school for instruction in scientific forestry is at the Escorial, where aspirants for the title of Forester (Inginiero de Montes) are given instruction. The number of students is about 50.

No systematic observations of a scientific nature have as yet been made in Spain with reference to the forests as a factor in the climate and rainfall.

PRIVATE FORESTS.

The forestry service has not yet intervened in the exploitation of private forests, and is therefore unable to state the acreage of the same.

The larger portion of the private forests are not subject to scientific treatment, exception made of a very few, transmitted in inheritance and belonging to the great houses of the nobility.

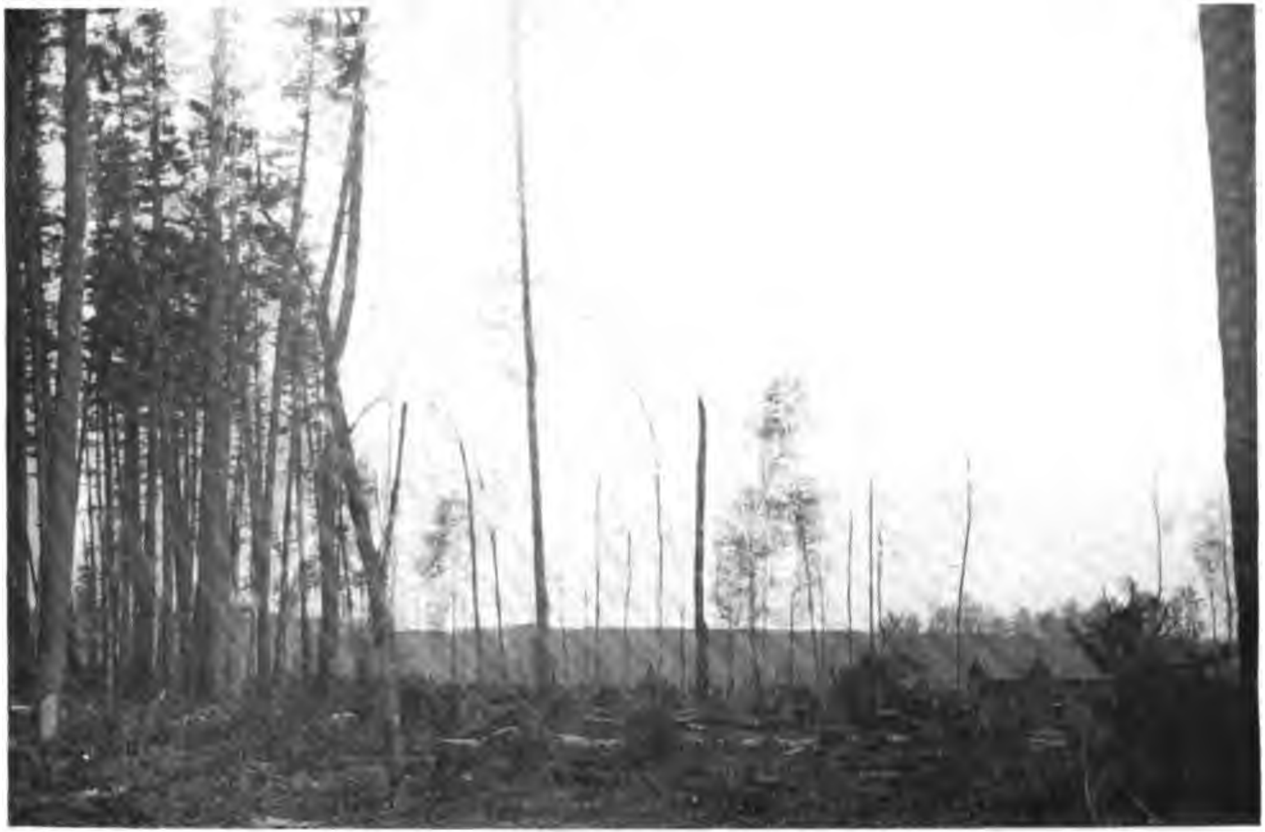
There is no especial tax on private forests, the same tax being applied to them as to farm properties.

The law of June 24, 1908, provides that private forests situated within the protected forest belt (zona protectora dasocratico) must conform in their exploitation to a forestry system formed by the Forestry Service for each forest for the purpose of securing the preservation of the trees. In case the owner does not agree to this plan the state shall proceed to the expropriation of the forest in behalf of the public utility.

SWEDEN.

STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is $4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was $185,397, and the aggregate revenue was $1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about $10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägmästare," with annual salary of $1,707 and rank corresponding to the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of $1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of $160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of $2,400, and having



Condition in which camps are often left after logging. Photographed for the Annual Report of the Forestry Commissioner of Minnesota.

rank corresponding to that of a major-general in the army; and a chief of bureau, with salary of $1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about $5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote re-growth of private forests.

FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000 acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area, not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive surface of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

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*Information furnished in Swedish by Dr. Fredrik Loven, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Rämen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The

Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500 feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harfjellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a "fjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each, and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one or two cows and several smaller animals are fed. About 14,000 persons live and gain their livelihood on the company's property.

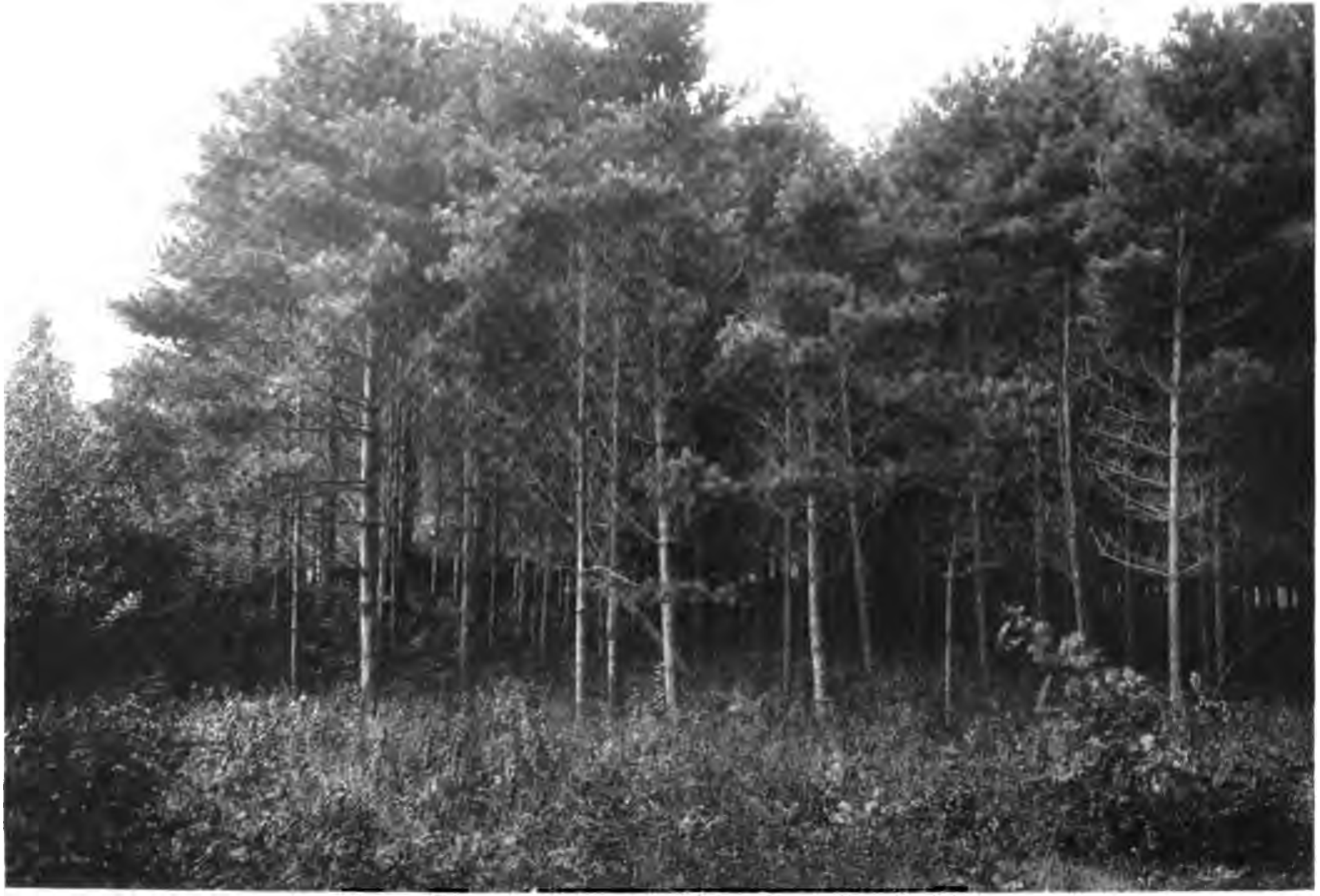
About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years, which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural seeding. The cuttings are not so large but what the bystanding trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by



Natural regrowth of white pine, twenty-five feet high and six to eight inches in diameter, on the Daniel Webster farm at Marshfield, Mass., from seed of pines that were planted by Mr. Webster seventy-four years ago.

extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than 100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to $0.85).

The income from game is not large. There are shot annually 12 elks, many hares and game birds.

SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. In conformity with the prescriptions of the federal law of October 11, 1904, all forests of Switzerland are placed under the supervision of the Confederation.

The Confederation itself is not actually the owner of any forests, but some of the separate states are owners. The forest domains are part of the national wealth, and comprise 96,497 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,414,677 acres. Besides there are private forests comprising 604,014 acres. The total area of forests is therefore 2,115,188 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in the high mountains. Forests are found standing at 200 meters above the sea level (in the canton of Tenin) and reach as high as 2,100 meters in the high mountains. In Grisons (Engadine) they even reach 2,300 meters in altitude.

The more common varities of trees are among the resinous kinds, the Norway Spruce (Picea excelsa) the Silver Fir (Abies pectinata) the Larch, the Scotch and Mountain pines, the Cimbrian pine; among the deciduous kinds, the beech and the chestnut trees; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value of per hectare (2½ acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1904 the expenses incurred by the Confederation for forest administration amounted to $112,600.

The following were the net receipts from State Forests in 1903 as to a few cantons:

Berne, 787,000 francs or 60 francs per hectare of forest.

Soleure, 31,500 francs or 38.33 francs per hectare of forest.

St. Gall, 58,000 francs or 59.62 francs per hectare of forest.

Schaffhouse, 113,100 francs or 45.33 francs per hectare of forest.

Argovie, 151,600 francs or 49.73 francs per hectare of forest.

Thurgovie, 83,000 francs or 65.90 francs per hectare of forest.

Neuchatel, 58,000 francs or 30.26 francs per hectare of forest.

The net receipts from towns of their forests in 1903 were:

Winterthur, 99,100 francs or 91.07 francs per hectare forest.

Schaffhouse, 35,000 francs or 77.05 francs per hectare of forest.

St. Gall, 104,800 francs or 144.36 francs per hectare of forest.

Coire, 49,200 francs or 43.65 francs per hectare of forest.

On an average about 593 acres of forest have been created annually during the past thirty years, at the expense of the Confederation, the cantons and the owners of the grounds.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective.

In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-sliding, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforesting by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislatures prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, as high-forest, coppice with standards and coppice.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested, except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed in courses lasting two months is attached to this technical personnel and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterthur Fribourg, Coire, Soleure, Schaffhouse

The Chief Federal Inspector of Forests has an annual salary of 8.000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed, his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall who has a salary of 5,000 francs, receives twelve francs per day and five francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the forest is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare. In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

WURTEMBERG.

STATE FORESTS.

The state forests of Wurtemberg comprise 462,816 acres. Wurtemberg is a high land country, the average elevation above sea level being 1,607 feet. The soil is in general adapted for timber production. Of the various kinds of timber, beech occupies 24 per cent and pine about 60 per cent. The average annual cut of pine is 25,000,000 cubic feet, at an age of from 90 to 100 years, with a diameter varying from 11 to 20 inches breast high. In addition to this, the cut includes 16,000,000 cubic feet of wood, including refuse, which is sold for fuel.

The timber is generally sold in each administrative district at auction on written bids. The average annual expense of administering and managing the state forests in recent years has been between $1,428,000 and $1,666,000; but not including forestry instruction nor the purchase of additional land. The gross annual revenue has been between $4,284,000 and $5,236,000. In general, the net income from forest capital is 2½ per cent. In pure stands of coniferous forest clear cutting is practiced, in other forests selection cutting. There are no statistics showing what proportion of cutover land becomes reforested by natural seeding. About 4,500 acres are annually planted. The age of the plants varies from one to eight years, according to their kind, and their distance apart likewise varies from a foot and a half to six feet.

Under average conditions fifty women plant 8,000 four year old trees per hectar (2.47 acres), at a cost of from $19 to $23.80; while under more difficult conditions, especially very rough, rocky soil, the expense may be three times as great.

In the last three calendar years the annual damage by forest fires has been $404.60.

About 20,000 persons are annually employed in the state forests on 1,330,000 working days, all of whom reside in or

Spruce and fir forest near Freudenstadt, Wurtemberg, Germany; age about 130 years. Shows how closely land becomes stocked with trees under scientific forestry management.

A German forest of young spruce, illustrating purity (that is, trees all of one kind) and density.

near the forests. A scientifically trained forester ("oberfoerster") has charge on an average of 3,237 acres of state forest and 2,866 acres of forest belonging to communities and other public corporations, making together a district of 6,103 acres. His salary varies from $690 to $1,071 a year, besides free official residence or equivalent rent and traveling expenses. Every officer having been permanently retired after nine years' service is entitled to a pension. The pay of the retired officer on entering the tenth year of service amounts to forty per cent of his former salary. With each succeeding year of service to the fortieth, inclusive, the salary increases 1, one and three-fourths per cent of the salary up to $571.20, inclusive; 2, one and one-half per cent of the salary exceeding $511.20.

The highest forest board (K. Forstdirektion) is composed of a chairman with title of "Direktor," with a salary of from $1,975 to $2,070.60, and associate members, who if they are graduate foresters, have the title of "Forestrat" (counsellor) and "Oberforstrat" (high counsellor), with salary of from $1,332.80 to $1,785.

Forestry was first introduced in the management of state forests about the first quarter of the last century.

Previous to April 1, 1881, scientific instruction in forestry was given in the Hohenheim academy. It was then transferred to the government university of Tubengen. The attendance at the lectures fluctuates, and in the last twenty years has averaged thirty-five. There are no lower grade forestry schools. For the education of forest guards (Forstschutzbeamten), who are chosen from the ranks of non-commissioned officers, a three-months' course for about twenty students is annually held at the post of the royal forest guard (Forstwache).

Scientific observations have been made as to the influence of forest upon climate and upon rainfall. The results cannot be summarized in a few words, but it can be remarked that the influence of forests on climate has been overestimated, the influence being noticeable only within limited boundaries. A general increase in rainfall is not proven. The forest only causes a different distribution of precipitation in forest areas and surrounding country.

PRIVATE FORESTS.

The extent of private forests is]544,057 acres, of which forty per cent are managed on forestry principles. They consist, first, of those belonging to the royal house and to the nobility and the title to which is hereditary and the capital of which cannot be impaired.

TAXATION OF PRIVATE FORESTS.

Private forests are subject to real estate and income taxes. In regard to the first, the average obtainable net income from the forest is established on the assumption of its proper management and considering all the circumstances. This fixes the value of the forest. The income tax is a tax on the gross annual income derived from the forest after deducting all ordinary expenses. There is no essential difference between the tax of private forests and the tax of private lands used for agriculture.

SUPERVISION OF PRIVATE FORESTS.

In the case of protection, forests which are important in preventing land slides, and washing of the soil or as protection of adjoining planted forests of principally pine and where complete or extensive clearing is intended, it is necessary, before cutting, to obtain permission of the forest police authority. In other private forests permission is only necessary where a piece of timber land is to be permanently cleared for other purposes than forestry. Ordinarily a cleared forest must be replanted within a specified time. Likewise, owners of private forests are enjoined from acts which would endanger the forest, such as an excessive removal of leaves for litter. Ownersof private forests are required to notify the forest police authority of dangers threatening the forest from natural causes and destructive animals.

THE WORKING PLAN.

The "Manual of Forestry" in five volumes, by Dr. William Schlich, principal professor of forestry at the Royal Indian Engineering College, Cooper's Hill, England, and formerly Inspector General of Forests to the Government of India, is the best work on the subject in the English language. Dr. Schlich has kindly given me permission to copy from his third volume an account of the "working plan" as used in forestry, and what follows on that subject is taken from that volume.

Forest working plans regulate, according to time and locality, the management of forests in such a manner that the objects of the industry are as fully as possible realized. The working plan for a protection forest, or a park-like forest, is altogether different from that of a forest which is managed on economic principles. The latter is the kind with which we have here to do.

The working plan report is a document which gives necessary information and which describes the system of management in such detail as may be required in each case. For forests which are of great value, and which yield high returns, very detailed plans should be drawn up; for forests which give as yet only small returns, simple plans would be indicated.

WORKING PLAN REPORT.

INTRODUCTION.

I.—GENERAL DESCRIPTION.

1. Name and situation of forest; name of proprietor.
2. Boundaries.
3. Area.
4. Configuration of the ground.
5. Rock and general character of the soil.
6. Climate.
7. Legal position of forest, rights and privileges.
8. Surrounding population and its requirements.
9. Markets, lines of export.
10. Prices of the several classes of produce.
11. Cost of extraction and of transport to markets; supply of labor.
12. General description of forest growth.
13. Injuries to which the crop is exposed.
14. Rate of growth.
15. Yield tables, volume tables. form factors, reducing co-efficients, etc., used in the calculation of the volume and increment of the woods.
16. Organization and strength of the forest staff.

II.—DETAILED DESCRIPTION OF DEPARTMENTS.

III.—DIVISION AND ALLOTMENT OF AREAS.

IV.—DESCRIPTION OF THE METHOD OF TREATMENT.

1. The objects of management.
2. Choice of species.
3. Choice of sylvicultural system.
4. Determination of the rotation.
5. General lines of treatment.
6. General lines of yield.

V.—SPECIAL WORKING PLANS.

1. Plans of utilization.
    - *a.* Final cuttings.
    - *b.* Intermediate cuttings.
    - *c.* Minor produce.
2. Plan of formation.
3. Plan of other works.
4. Maps illustrating the condition of the forest and the proposed treatment.

VI.—MISCELLANEOUS.

1. Reorganization of the forest staff.
2. Financial forecast.
3. Proposals for the control of the execution of the working plan.
4. Miscellaneous observations.

WORKING PLAN FOR A PORTION OF THE STATE FORESTS OF THE HERRENWIES RANGE IN THE BLACK FOREST, GRAND DUCHY OF BADEN.

PERIOD 1884—1893.

WITH THE RESULTS OF THE ACTUAL WORKING.

GENERAL DESCRIPTION.

1. *Area and Boundaries.*

The areas are recorded as follows:

(*a*) Productive area	1,747 acres
(*b*) Unproductive area	nil. "
(*c*) Other areas, including fields, meadows, etc.	2 "
Total area	= 1,749 acres

c. The third group comprises the so-called "Grinden," that is to say the highest parts of the ridges, which are mostly level and have a tendency to bogginess. They are covered by a dense growth of bilberry and heather, and are incapable of producing more than a stunted tree growth, which yields only a scanty quantity of firewood, frequently not covering the price of preparing it; hence financial considerations are entirely out of the question, the areas being protected merely for the sake of preserving some cover on the hill tops. The group comprises all parts which produce an annual increment per acre of 7 cubic feet and under; they amount to 10 per cent of the total area.

In so far as the management aims at the production of valuable material, and at favorable financial results as regards outlay for artificial regeneration (where natural regeneration has failed), for improvement, tending, etc., only the areas in the first group can be considered. But in the treatment of those forests which pertain to the principal mountain region of the Black Forest, representing a certain drainage area, the task of forestry goes beyond mere financial considerations. It has in fact been recognized that it is necessary to keep areas of this class well wooded for the sake of a proper husbanding of the water supply in the streams. Accepting this further task, the forest administration has endeavored, during the last 50 years, to afforest the poorly stocked and frequently entirely bare areas at the higher elevations of the Bunter Sandstein region. In so far as the cultural operations were confined to the boulder drifts of the Bunter Sandstein, they were moderately successful, but the cultural attempts made in the "Grinden" prior to 1870 turned out failures. Since 1873 the cultural operations in the Grinden present a more hopeful aspect, owing to the experience gained by former failures, and it seems desirable to continue them in the future.

The working plan deals in detail only with the forest area subjected to intensive management, but the group worked under the selection system has also been adequately noticed in the general provisions.

The working plan lays special stress upon the execution of improvement fellings, more particularly the removal of cancerous silver firs. For this purpose the ordinary thinnings are utilized; but over and above these, cancerous trees must also be removed from the old woods, where otherwise no further thinnings would be required. In regeneration fellings the trees to fall first under the axe must be those attacked by cancer. Even then not nearly all cancerous trees can be removed during the next ten years. This fact teaches the management that in future a sharp attack must be made on all cancerous trees at the time of the first and second thinnings, even if a temporary interruption of the canopy should thereby be caused. On the rich deep soils of the granite area, which are almost exclusively concerned in these remarks, even an interruption of the canopy extending over a somewhat lengthy period would not be a misfortune, and preferable to the maintenance of a full canopy consisting to a considerable extent of cancerous trees. The existence of enormous quantities of such trees on the granite area was one of the reasons which led to the yield being fixed at its present rate.

5. *Utilization.*

a. Yield of Major Produce.—The actual yield during the last 40 years has been as follows:

Compartment.	Yield, in Solid Cubic Feet.					
	1844-53.	1854-63.	1864-73.	1874-83.	Total.	Area in Acres.
1. Schwarzenbronn....	213,336	122,869	149,843	79,141	565,189	65
2. Schwarzenberg.....	311,518	158,778	200,733	158,955	829,984	211
3. Riesenkopf.........	12,502	47,288	206,242	65,617	331,649	76
4. Mehliskopf..........	....	....	....	....	....	84
5. Grünwinkel.........	19,742	124,629	57,423	202,252	404,046	203
6. Dobelbach...........	26,875	42,697	30,195	69,925	169,692	173
7. Hoher Ochsenkopf..	....	....	....	....	....	101
8. Kleingartenkopf....	34,256	2,331	1,448	1,024	39,059	76
9. Kleingarten.........	375,687	138,825	256,608	195,578	966,698	363
10. Grossgarten.........	63,544	45,688	26,417	59,118	194,767	175
11. Sachsenbronn.......	34,927	47,783	111,351	106,194	300,255	95
12. Gartenbach.........	85,811	83,845	494,665	156,412	820,733	173
	1,178,198	814,733	1,534,920	1,094,216	4,622,067	1,747
Average per year.......	117,820	81,473	153,492	109,422	115,552	....
Average per year and acre....................	67.44	46.64	87.86	62.63	66.14	....

From the appended statistical table it will be seen that the estimated increment of the next ten years amounts to 1,086,130 cubic feet.

The actual growing stock amounts to			9,488,731	cubic feet
The normal	"	"	7,892,160	"
The surplus of	"	"	1,596,571	"

The surplus of growing stock is due to a surplus of woods over 100 years old. With favorable prices for timber, the removal of this surplus in the shortest possible time would be advisable, so as to prevent loss of increment, and take unnecessary capitol out of the forest, but as prices run low at present, it appears judicious to keep the greater part of it over for a while.

A consideration of the several compartments showed that the removal of the following material during the next ten years is advisable on sylvicultural grounds:

Final cuttings . . .	1,146,000	cubic feet
Intermediate cuttings . . .	154,000	"
Total . . .	1,300,000	"

As this amount exceeds the expected increment by 213,870 cubic feet, equal to about one-seventh of the surplus of growing stocks, the yield has been fixed at 1,300,000 cubic feet, or annually:—

Final cuttings . . .	114,600	cubic feet
Intermediate cuttings . . .	15,400	"
Total . . .	130,000	"

If in the course of the 10 years prices should rise, there would be no objection to reduce the surplus of growing stock further by additional cuttings.

The climate is rough, and is characterized by long winters with an abundant snowfall, and by rapid changes of temperature; at the same time it is throughout favorable for forest vegetation, especially for conifers.

3. *Species.*

The details will be found in the description of compartments. Generally speaking, the spruce and silver fir are the prevailing trees, the former being more abundant in the middle and upper parts, the latter at the lower elevations. The beech is associated with them locally and in varying proportions. Scotch pine is found in the granite region chiefly upon dry, steep, rocky slopes with a southerly aspect, and in the sandstone region, especially on dry ridges and the top of the mountains, as well as here and there in other localities. The three conifers attain a maximum height of 140 feet, with regular shaped and little tapering stems. Toward the upper limit of the area the height growth diminishes rapidly, dwindling down to 20 or even 15 feet on the high plateaux. Here the mountain pine and the birch are also found. Reproduction is generally good, except at the higher elevations. A marked difference is found between northern and southern slopes, the growth and reproduction being far more vigorous on the former than on the latter.

The silver fir is much exposed to cancer. Windfalls and snow breakage are fairly moderate, while the damage from insect attacks is very small. During the years 1874-83, the following proportion existed between the different classes of fellings:

Cuttings caused by insect attacks	= 1	per cent of total fellings.
" " snow breaks	= 12	" " "
" " windfalls	= 16	" " "
Cancer and other diseases and injury	= 19	" " "
Other cuttings	= 52	" " "
Total	= 100	" " "

4. *Method of Treatment and Rotation.*

The situation and the species necessitate the area being treated under the high forest system. The quality gradations, as indicated under 2, are so conspicuous locally that it is possible (as well as desirable in order to secure a proper idea of the condition of the forest), to group the growing stock according to its characteristics as produced by the quality of the locality, and according to the method of treatment thereby indicated. The actual basis of this grouping is the yield, and based upon it, the net income or financial result of the management. In this sense the forest may be divided into the following three groups:

a. Areas Subjected to an Intensive Management.—To this group belong all areas which, in virtue of their quality (as indicated mainly by the height growth of the trees on fully stocked areas) are capable of producing large timber; areas on which carefully conducted regeneration fellings will produce natural regeneration within a reasonable period of time, and where the cost of any artificial assistance in regeneration is commensurate with the anticipated returns. As lowest limit of this group a normal increment of 43 cubic feet per year and acre, calculated for a rotation of 120 years, has been fixed. The area thus included in the group amounts to 78 per cent of the whole. It is with this area, and the growing stock standing on it, that the management must more especially reckon, and from which the largest possible sustained yield must be secured. With a suitable composition of the growing stock and a careful application of sylvicultural principles, that object may be obtained under an average rotation of 120 years.

As regards the sylvicultural treatment, and especially the regeneration of the woods, two different classes of forest or growing stock (corresponding with two qualities of locality) stand out prominently.

First: Forest of spruce with a strong admixture of silver fir (the latter occasionally predominating) more or less frequently interspersed with beech and more rarely with Scotch pine.

Secondly: Forest in which spruce prodominates with a slight admixture of silver fir and here and there of Scotch pine, but devoid of beech.

The first class of forest occurs in the granite area and on those parts of the Bunter Sandstein (clay sandstone), which have deep, easily decomposed soils fit to be classed as good. The characteristic features of this class of forest are the occurrence of beech and deep soils, rarely covered with boulders or debris, lying mostly at the lower elevations; natural regeneration can here be successfully effected in a comparatively short period of time.

The second class of forest occupies the stony slopes of the Bunter Sandstein area, and in exceptional cases the quartzite parts of the granite area. Here the soil is generally covered with loose boulders and rock debries of varying size. These areas are nearly all found at the middle to upper elevations. The conditions described demand the maintenance of an uninterrupted canopy up to the age of maturity, and a careful execution of the regeneration cuttings spread over a prolonged period of time, or else weeds will spring up, which make regeneration very difficult, and at any rate expensive.

On the whole, however, careful management is sure to be successful in securing natural regeneration in all the areas pertaining to this group; for this purpose, as well as for the production of valuable timber, a rotation of 120 years on an average is considered of sufficient length. The length of the regeneration period differs considerably in the different parts, varying on the whole from 30 to 50 years.

b. The second group consists of woods growing on soils, which, even under the most careful management, cannot be expected to produce trees of first or even second quality. The trees here produced are of such limited height growth, that the production of valuable timber is out of the question. The woods are found in the upper, and here and there in the lower part of the Bunter Sandstein area, where the soil is covered with large masses of the debris of gravelly sandstone, which is not easily decomposed, and where the slightest interruption of the canopy overhead is followed by the appearance of a dense growth of bilberry and heather.

Nevertheless, these areas are capable of yielding timber of the inferior classes, as well as firewood, and the returns which may reasonably be expected from them, justify the application of a method of treatment which, while avoiding any interruption in the canopy and all expensive cultural operations, facilitates natural regeneration; in other words the treatment under the selection system by removing all trees which are deteriorating or incapable of increasing in value. It is difficult to fix any definite rotation, but it is estimated that the trees will take about 150 years to reach maturity.

The lowest quality limit for this group has been fixed at 7 cubic feet increment per acre and year, while the upper limit is, as already indicated, 43 cubic feet. The area comprised in this group amounts to 12 per cent of the total area.

Alterations in the above figures will probably become necessary when a fresh survey is made.

The outer boundaries are in order, but the internal boundaries require rectification.

2. *Locality.*

The forest here in question occupies on the whole the slopes lying between a hill range on the south and the river Schwarzenbach on the north. The highest point of the hill range, the Hoher Ochsenkopf, has an elevation of 3,465 feet above the sea, while the lowest part, near the Schwarzenbach, is only 2,000 feet above the sea, the mean elevation being placed at 2,600 feet.

The slopes, on which the forest is found, are mostly steep, level spots being only found on the summits of the hills, and toward the lower end, where granite and Bunter Sandstein meet.

The area is drained by the Schwarzenbach (a feeder of the Raumünzach) with its two feeders, the Gartenbach and Dobelbach. The first mentioned runs from west to east, and the two latter, more or less, from south-west toward north-east. It follows that the forest in the valley of the Schwarzenbach has generally a north aspect, and in the valleys of the Gartenbach and Dobelbach a northwest aspect on one side, and a southeast aspect on the other side of the streams. All the forest areas (except those situated at the highest elevations and which are of no importance) are protected by intervening ranges against the prevailing winds.

Up to a mean elevation of 2,500 feet, granite is the principal rock, which is sometimes (though rarely) pierced by porphyry. Above the afore-mentioned elevation the granite underlies upper Bunter Sandstein (Vogesen Sandstein), and the latter accordingly prevails in the larger part of the forest area.

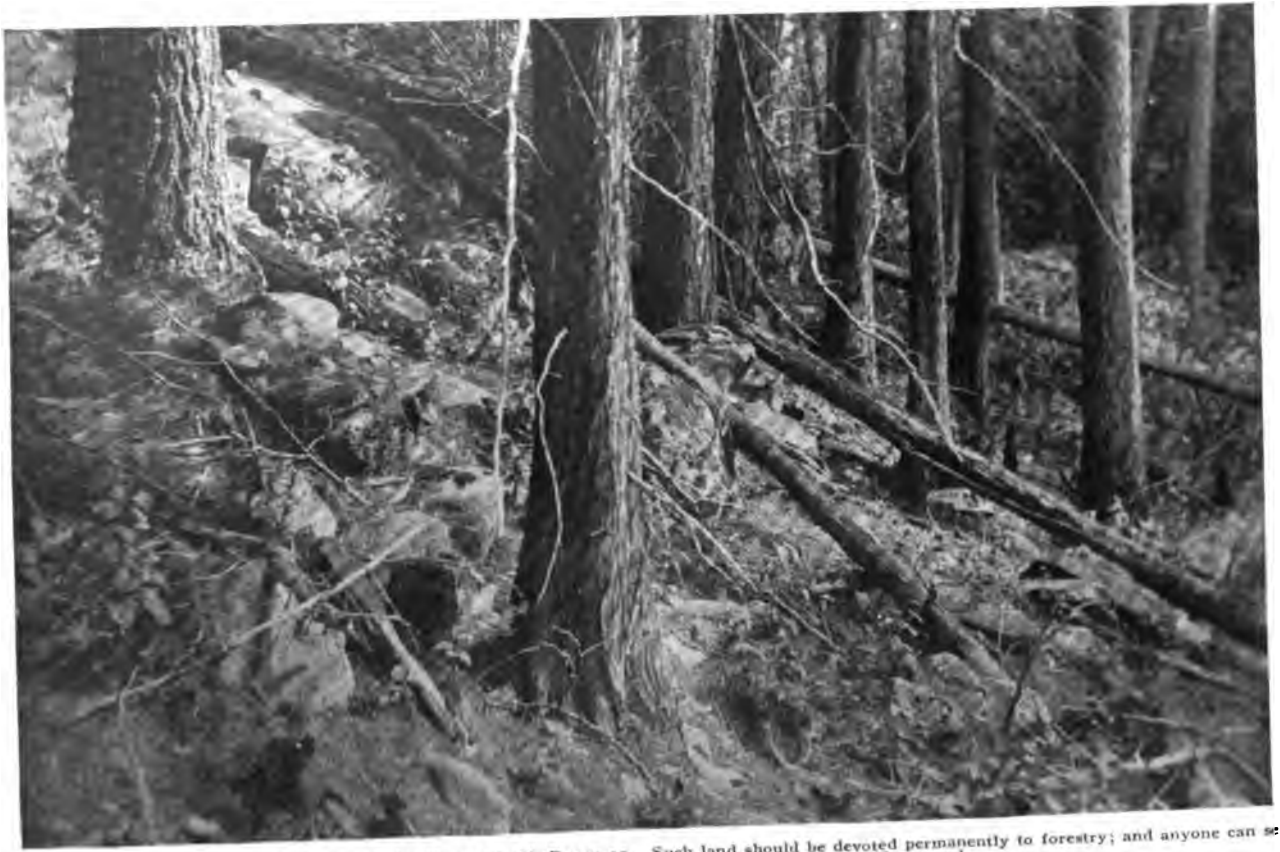
The granite is generally rich in orthoclase and oligoclase, and therefore decomposes readily, and furnishes mostly a deep soil rich in mineral elements. The decomposition is facilitated, and the quality of the soil improved, by the remarkably numerous springs which appear between the granite and the Bunter Sandstein. Hard slow decomposing quartzite is of rare occurrence.

The Bunter Sandstein is characterized by rapidly and greatly changing mineral composition, consisting sometimes of readily decomposing rock yielding a deep clay soil, in other cases of hard quartz-gravel, frequently found on the surface in the numerous bolder-drifts. The Bunter Sandstein has numerous rents and fissures in all directions, so that it is rapidly drained, and the disintegration and decomposition are only rarely assisted by springs, which at the best are scanty and intermittent. It follows that the Bunter Sandstein soils, even when formed by the easily decomposed and minerally rich clay sandstone, never equal the best quality of the granite soil; moreover, they change frequently and very suddenly, and without any visible cause, into almost unproductive areas.

On the flat hill tops, layers of fine white sand (produced by the disintegration of the gravelly sandstone) frequently produces an impermeable stratum, preventing the water from percolating, thus causing bogs (or "Grinde") which often extend over considerable areas and are almost unproductive.

The quality of the soil, therefore, ranges between good and unproductive, in the following proportion:

Good and fairly good to medium	= 78	per cent.
Medium to indifferent	= 12	"
Indifferent to unproductive	= 10	"



Rocky country, a little south of Elephant Lake, Township 66, Range 19. Such land should be devoted permanently to forestry; and anyone can see by the pine trees it bears that it would yield good revenue if so used.

The disposal of the yield is effected as follows:

1) Free grant to the Roman Catholic Priest at Herrenwies,	=	1,500 cubic feet.
" " " School "	=	1,000 "
(2) Sale by public auction and occasionally by private sale,	=	127,500 "
Total annual disposals		130,000 "

b. Minor Produce.—The principal items are forest pasture and the removal of litter, the utilization of which is permitted to the Herrenwies settlers, as a privilege.

According to government orders the privilege of forest pasture may be exercised only to such extent as the condition of the forest and the requirements of regeneration may permit. The district forest officer indicates from time to time the localities in which the privilege may be exercised. The privilege of removing litter free of charge is exercised under the same conditions. The exercise of these privileges is nowhere injurious, and may be continued during the next ten years.

The grass growing in blanks, on roads and in plantations has hitherto been sold for the benefit of the State, and, under suitable supervision, the practice may be continued.

The removal of building stones, the sale of plants, etc., is insignificant.

6. *Division into Compartments.*

The contemplated new division into compartments must be postponed until the projected road system has been completed.

DESCRIPTION OF COMPARTMENTS.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
I. Ochsenköpfe.			
Schwarzenbronn	1	65	Spruce with silver fir, some beech, Scotch pine, larch. About .6 of area 30—50 years old, some trees older. About .4 of area 10—30 years old. Above the road fairly complete stocking; in youngest parts still suffering from frost; below road still some blanks caused by late cutting out of old trees; in the latter part still 120—150 years old spruce and silver fir in the final stage; these show a decreasing increment. Growth on the whole fairly good.
Schwarzenberg	2	211	*a* — 180 acres; 15—40 years old spruce and silver fir with some Scotch pine and beech; some lately planted, younger, a few up to 60 years old. About 25 acres planted. Where the shelter wood has been removed, stocking generally complete, in the rest still patchy with patches of bilberry intervening. Growth generally between good and fairly good; along Herrenwies meadows partly only fair, the spruce still suffering from frost. In the north-western part, below the road, on the Riesenkopf road, and in the south-east along Dobelbach, on about 87 acres 110—140 years old spruce and silver firs of decreasing increment are standing in the final stage.

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
			b — 81 acres (in three parts), spruce and silver fir with a few beech and Scotch pine, generally 50—75 years old, but some small groups only 30—50 years old; generally well stocked, here and there somewhat thin and patchy. Growth between good and fairly good. On 8 acres on the Dobelbach, 80—90 years old spruce, cover complete and growth good.
Riesenkopf...........	3	76	*a* — 47 acres; 100—180 years old spruce and silver fir, some older; on the whole cover fairly complete; toward compartment Schwarzenberg somewhat thin, but on about 10 acres with a fair young crop of silver fir and spruce up to 15 years old. Growth fairly good, on the higher part inferior. About 5 acres along the road is a windfall area, now stocked with some silver fir and spruce growth. *b* — 24 acres; 9—20 years old spruce (a few older), with some Scotch pine and larch, mostly well stocked, showing good to fairly good growth. *c* — 5 acres; Grinde, in upper part heather covered, with 100 and more years old short and stunted Scotch pine, some spruce and mountain pine. On the whole poorly stocked. Part underplanted with 20—40 years old spruce, which show very poor growth.
Mehliskopf...........	4	84	50—90 years old (and more), mountain pine with some spruce, Scotch pine, birch and mountain ash; toward compartments 3 and 5 cover fairly complete, in the southern and south-western parts interrupted by larger and smaller areas of heather. Growth inferior.
Grünwinkel..........	5	202	*a* — 186 acres; 110—150 years old, some older, spruce and silver fir, some beech with a few Scotch pine. In irregular final and seeding stage, in the southern part cover still fairly complete in strips. On .4 of the area stocked with up to 80 years old silver fir and spruce and a few beech. Growth of old trees still fairly good; on some stony ridges (about 7 acres) middling and inferior; young growth mostly only middling. *b* — 16 acres on the highest part in the south and west, Grinde; heather-ground with 100 and more years old crippled Scotch pine, spruce, some mountain pine and birch; in some parts up to 60 years old advance growth thinly stocked. Here and there traces of plantings, 24 years old spruce.
Dobelbach............	6	178	*a* — 133 acres; 100—180 years old, some up to 200 years, spruce and silver fir, some Scotch pine; on the whole cover fairly complete; only in the western third along Grünwinkel through windfalls and dry wood cuttings somewhat thin and patchy; in the thin parts as yet little, up to 15 years old, advance growth in single trees. Growth good to fairly good. (Ilex found). *b* — 27 acres (consisting of the upper south-eastern portion and a ridge running from it in a north-western direction to the centre of the compartment), 100—180 years old (some older), short-stemmed spruce with some Scotch pine and silver fir forming a thin, often very thin, wood; in parts younger up to 60 years old spruce, or an incomplete miserable under-

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
			growth of 25 years old spruce and Scotch pine (experimental planting). Growth middling to inferior. *c* — 18 acres (uppermost part on the south) Grinde; heather land with 100 years and more old crippled Scotch pine, some spruce, birch thinly stocked; here and there remnants of 25 years old planted spruce and Scotch pine.
Hoher Ochsen........	7	101	70 and up to over 100 years old Scotch pine and mountain pine with spruce, some birch, sometimes forming a very thin wood of single trees, sometimes in smaller or larger groups; everywhere intersected by heather places and blanks. Growth inferior, even crippled.
Kleingartenkopf.....	8	76	100—120 years old, in some parts younger, some over 300 years old, spruce with Scotch pine, few silver fir, some mountain pine. In the western third and on the eastern point still fairly well stocked, some groups even well stocked; otherwise the wood is very thin and open. Growth middling to inferior; here and there an incomplete miserable undergrowth of 30—50 and more years old spruce and Scotch pine (planted).
Kleingarten..........	9	362	*a* — 161 acres; spruce and silver fir, some beech. Mostly 50—80 years old, in strips and single trees up to 100 years old, others only 30—50 years old. In the eastern part are about 50 acres 80—100 years old. Everywhere spruce and silver fir standards up to 150 years old, mostly showing good growth. Almost throughout rather thinly stocked, here and there patchy, in consequence of late final cuttings and removal of cancerous silver firs. Growth mostly good, only toward the southern higher part decreasing. *b* — 122 acres (in 8 places); spruce and silver fir with some beech, $\frac{15\text{—}40}{\text{average} — 30}$ years old, some groups up to 50 years; mostly fully stocked. 120—150 years old (some older) mostly pruned spruce and silver firs in the final stage are standing almost everywhere over the above younger growth. The strip along Dobelbach is finally cleared. Growth good; of the old trees fairly good. *c* — 79 acres (upper part toward the south), 120—300 years old pruned Scotch pine and spruce, few silver fir and birch, thinly stocked, often open; on the whole poorly undergrown with 20—50 years old spruce (mostly planted), a few silver fir; the latter in some places form, with up to 100 years old spruce, the picture of a selection forest. Soil much covered with heather. Growth middling to bad; rarely fairly good. On 6 acres near compartment Dobelbach on the main path, 100 and more years old spruce, with a few Scotch pine and silver fir, form a thin canopy and show middling growth.
Grossgarten..........	10	175	*a* — 108 acres; spruce and silver fir 80—110 years old, some up to 150, some beech and a few Scotch pine. Partly fully stocked, but the greater part somewhat thin, in the lower part very thin; and here spruce and silver fir advance growth up to 50 years old in single trees and groups. Growth good to fairly good; in

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
			the upper parts with stones (Halde), partly middling only. *b* — 37 acres. (Ridge through middle of compartment and strip on south, southwest, and northwest.) 90—110, some up to 200 years old, spruce and Scotch pine, some silver firs, in the uppermost part some mountain pine in a thin, patchy, and often very thin wood; most of inferior growth; here and there traces of 30—40 years old spruce plantings. *c* — 30 acres (adjoining compartment Kleingarten). A wood resembling a selection forest, of spruce and silver fir with beech, the trees 30—60 years old prevailing; little quite young. The 100—120 years old and older trees appear single and in groups. Growth good; above the cattle track inferior.
Sachsenbronn........	11	95 (and 2 acres other areas.)	100—120 years old (some up to 200 years), spruce and silver fir, also some beech, namely: On 42 acres, final stage, partly pruned, throughout with $\frac{10—30}{20}$ years old (in the western part up to 40 years old), silver fir and spruce young growth; about 25 acres in the position of the seeding stage brought about by windfalls and dry wood cuttings; on 5 acres 80—100 years old, generally complete cover; in the thinner stocked parts is found up to 15 years old silver fir and spruce young growth; on 12 acres (southeastern corner, near compartment Gartenbach) generally canopy complete, here and there with a little advance growth. On 10 acres (in the west), 70—90 years old, some older spruce with silver fir, fairly complete canopy. On 7 acres (western point), 12—40 years old (in groups and single up to 60 years old), mostly irregular young growth of spruce with some silver fir, forming a fairly complete stocking. Growth of old trees good to fairly good, in the pruned portions partly less good; growth of young wood fairly good.
Gartenbach	12	172	110—140 years old spruce, silver fir, some older, some Scotch pine, the latter prevailing in places in the upper part, few beech; in the northern two-thirds in the final stage, partly in seeding stage. In these two-thirds about 85 acres are stocked with young growth of spruce and silver fir pretty completely, in the eastern part very fully; in the southern third still fairly complete cover, but on the western slope, already somewhat thin, as yet little young growth. Growth in northern two-thirds good, in the southern third good to fairly good; in the upper part, in the southeast, only middling. In the middle of the compartment are 3 windfalls and 1 beetle clearing, together 12 acres; of these, 7 acres fairly well stocked with up to 25 years old spruce and silver fir.

Year.	Description of Cuttings, Cultivation, etc.	Cutting.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final Cubic feet.	Intermediate Cubic feet.			
Provision of Working Plan.						
	Final cutting in regenerated part..	34,000	....	....	....	....
	Filling up blanks with spruce.....	....	....	3	....	....
	Thinning and cutting of cancerous silver firs........................	....	10,000	....	....	....
	Total...........................	34,000	10,000	3	....	....
Execution.						
1884	Final cutting......................	14,297	....	....	....	....
1884	Dry and windfall wood............	818	....	....	....	....
1885	Windfalls..........................	665	....	....	....	....
1886	Final cutting, thinning............	6,166	832	....	....	....
1886	Windfalls..........................	547	....	....	....	....
1887	Windfalls..........................	1,868	....	....	....	....
1888	Final cutting, thinning............	7,759	11,717	....	....	....
1888	Planting...........................	....	....	1.7	....	....
1888	Windfalls..........................	88	....	....	....	....
1889	Dry wood, windfalls...............	649	....	....	....	....
1889	Planting...........................	....	....	2.2	....	....
1890	Windfalls..........................	698	....	....	....	....
1890	Planting...........................	....	....	.1	....	....
1891	Planting...........................	....	....	.2	....	....
1892	Planting...........................	....	....	.1	....	....
1893	Planting...........................	....	....	.1	....	....
	Total...........................	33,084	12,549	4.4	....	....

TABULAR STATISTICAL REPORT

COMPARTMENTS.		DISTRIBUTION OF AGE					
		1—40 years old.		41—60.		61—80.	
Name.	No.	Cubic feet.	Acres	Cubic feet.	Acres	Cubic feet.	Acres
		I. Working-section—Yield-capacity over					
Schwarzenbronn	1	43,030	41	70,630	20	....	.....
Schwarzenberg	2	200,945	117	169,514	40	192,117	40
Riesenkopf	3	19,072	34	....	.....	....	.....
Grünwinkel	5	21,189	38	....	.....	....	.....
Dobelbach	6	....	.....	....	.....	....	.....
Kleingarten	9	109,479	87	201,299	37	423,787	67
Grossgarten	10	26,487	24	46,617	11	25,074	5
Sachsenbronn	11	28,605	51	....	.....	35,316	5
Gartenbach	12	18,420	48	....	.....	....	.....
Total	.....	467,227	440	488,060	108	676,294	117
Normal state under a rotation of 120 years	.....	....	.....	....	.....	....	.....
Comparison of real and normal state +	.....	....	.....	....	.....	....	.....
Comparison of real and normal state —	.....	....	.....	....	.....	....	.....
		II. Working-section—Yield-capacity from					
Dobelbach	6	1,770	.....	....	.....	....	.....
Kleingartenkopf	8	10,595	25	....	.....	....	.....
Kleingarten	9	10,948	25	....	.....	....	.....
Grossgarten	10	....	.....	....	.....	....	.....
Total	.....	23,313	50	....	.....	....	.....
Normal state under a rotation of 120 years	.....	....	.....	....	.....	....	.....
Comparison of real and normal state +	.....	....	.....	....	.....	....	.....
Comparison of real and normal state —	.....	....	.....	....	.....	....	.....
		III. Working-section—Yield-capacity 7					
Riesenkopf	3	....	.....	....	.....	....	.....
Mehliskopf	4	....	.....	....	.....	18,900	34
Grünwinkel	5	....	.....	....	.....	....	.....
Dobelbach	6	....	.....	....	.....	....	.....
Hoher Ochsenkopf	7	....	.....	....	.....	....	.....
Total	.....	....	.....	....	.....	18,900	34
Normal state under a rotation of 120 years	.....	....	.....	....	.....	....	.....
Comparison of real and normal state +	.....	....	.....	....	.....	....	.....
Comparison of real and normal state —	.....	....	.....	....	.....	....	.....
				Summary of the			
Real state of forest	.....	....	.....	....	.....	....	.....
Normal state of forest	.....	....	.....	....	.....	....	.....
Comparison of real and normal state +	.....	....	.....	....	.....	....	.....
Comparison of real and normal state —	.....	....	.....	....	.....	....	.....

OF THE HERRENWIES RANGE.

Classes.						Volume per acre, cubic feet.	Increment.			
81—100.		Over 100 years.		Total.			Annual, per acre.		Total in 10 years.	
Cubic ft.	Acres	Cubic ft.	Acres	Cubic ft.	Acres		Normal	Real.	Normal.	Real.
43 cubic feet per Acre Annually.										
....	......	84,250	4	152,910	65	2,352	85	70	55,250	45,500
15,892	2	118,662	12	697,130	211	3,304	85	75	179,350	158,250
....	......	381,408	37	400,480	71	5,641	70	61	49,700	43,310
....	......	1,606,861	148	1,628,050	186	8,753	85	71	158,100	132,060
....	......	1,522,104	133	1,522,104	133	11,444	100	71	133,000	94,430
353,156	49	540,329	43	1,628,050	283	5,753	100	78	283,000	220,740
494,418	49	365,870	49	958,466	138	6,945	85	85	117,300	117,300
42,379	5	459,103	34	565,403	95	5,952	100	71	95,000	67,450
....	......	1,373,758	124	1,387,178	172	8,065	100	86	172,000	147,920
905,845	105	6,402,845	584	8,939,771	1,354	6,603	....	76	....	1,026,960
....	......	....	......	7,456,200	......	5,507	92	......	1,242,700	....
....	......	....	......	1,483,571	......	1,096	....	......	....	....
....	......	....	......	....	......	....	....	16	....	5,740
7 to 43 cubic feet per Acre Annually.										
....	......	38,850	27	40,620	27	1,504	30	21	8,100	5,670
....	......	203,418	51	214,018	76	2,816	14	14	10,640	10,640
....	......	108,419	54	119,367	79	1,511	43	29	33,970	22,910
....	......	79,460	37	79,460	37	2,148	21	21	7,770	7,770
....	......	430,147	169	453,460	219	2,071	....	21	....	46,990
....	......	....	......	362,880	......	1,657	28	......	60,480	....
....	......	....	......	90,580	......	414	....	......	....	....
....	......	....	......	....	......	....	....	7	....	13,490
cubic feet and under per Acre Annually.										
....	......	4,500	5	4,500	5	900	7	7	350	350
....	......	....	......	18,900	34	556	7	7	2,380	2,380
....	......	11,300	16	11,300	16	706	7	7	1,120	1,120
....	......	7,400	18	7,400	18	411	7	7	1,260	1,260
....	......	53,400	101	53,400	101	529	7	7	7,070	7,070
....	......	76,600	140	95,500	174	549	....	7	....	12,180
....	......	....	......	73,080	......	420	7	......	12,180	....
....	......	....	......	22,420	......	129	....	......	....	....
....	......	....	......	....	......	....	....	......	....	....
Three Working Sections.										
....	......	....	......	9,488,731	......	....	....	......	....	1,086,130
....	......	....	......	7,892,160	......	....	....	......	1,315,360	....
....	......	....	......	1,596,571	......	....	....	......	....	....
....	......	....	......	....	......	....	....	......	....	229,230

SPECIAL WORKING PLAN.

Compartments.	Description of Cuttings, Cultivation, Etc.	Cuttings.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
1. Schwarzenbronn..	Final cutting in regenerated part..............	34,000	....	....	....	....
	Filling up blanks with spruce..................	....	....	8	....	....
	Thinning and cutting of cancerous silver firs....	....	10,000	....	....	....
	Total................	34,000	10,000	8	....	....
2. Schwarzenberg....	*a* Thinning of shelterwood and partial final cutting	35,000	....	....	....	....
	Filling up blanks with spruce and Scotch pine.	....	....	10	....	....
	a and *b* Thinning and removal of cancerous trees......	....	53,000	....	....	....
	Total................	35,000	53,000	10	....	....
3. Riesenkopf........	*a* Seeding cutting, and partly final cutting..... *b* and *c* Rest.	53,000	....	....	....	....
	Total................	53,000	....	....	....	....
4. Mehliskopf........	Rest.					
5. Grünwinkel.......	*a* Thinning of shelterwood, seeding cutting in the fully stocked parts by the removal of cancerous and large trees...... .... *b* Rest	318,000	....	....	....	....
	Total................	318,000	....	....	....	....
6. Dobelbach.........	*a* Thinning and removal of cancerous trees...... *b* and *c* Rest.	19,000	19,000	....	....	....
	Construction of an export road to meet the main road............	....	....	....	....	4,900
	Total................	19,000	19,000	....	....	4,900
7. Hoher Ochsenkopf	Rest.					
8. Kleingartenkopf..	Rest.					

SPECIAL WORKING PLAN—*Continued.*

Compartments.	Description of Cuttings, Cultivation, Etc.	Cuttings.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
9. Kleingarten......	*a* Cutting of all old standards and cancerous trees..................	45,000	....	....	....	....
	Thinning..................	....	8,000	....	....	....
	b Thinning of shelterwood and partially final cutting..................	198,000	....	....	....	....
	Filling up blanks with spruce..................	....	....	12	....	....
	c Cutting out of old defective trees where young growth exists...	14,000	....	....	....	....
	Construction of an export road to meet the main road..................	....	....	....	....	9,500
	Total..................	257,000	8,000	12	....	9,500
10. Grossgarten	*a* Thinning and removal of cancerous trees......	47,000	47,000	....	....	....
	b Rest.					
	c Removal of standards and cancerous trees....	25,000	....	....	....	....
	Thinning..................	....	15,000	....	....	....
	Construction of an export road..................	....	....	....	....	5,000
	Total..................	72,000	62,000	....	....	5,000
11. Sachsenbronn....	In the regeneration area: thinning of shelterwood and partially final clearing; in the rest seeding cutting.........	168,000	....	....	....	....
	Filling up blanks with spruce..................	....	....	8	....	....
	Construction of an export road..................	....	....	....	....	8,500
	Total..................	168,000	....	8	....	8,500
12. Gartenbach.......	Continuation of regeneration cuttings and removal of cancerous trees..................	195,000	....	....	....	....
	Thinning in fully stocked parts..................	....	7,000	....	....	....
	Filling up blanks with spruce and Scotch pine.	....	....	8	....	....
	Construction of an export road..................	....	....	....	....	8,000
	Total..................	195,000	7,000	8	....	8,000

SUMMARY OF THE PROVISIONS OF THE

COMPARTMENT.	PROVISIONS OF WORKING PLAN.					
	Cuttings.			Cultivation. Acres.	Draining. Feet.	Road Construction.
	Final. Cubic Feet.	Intermediate. Cubic Feet.	Total Cubic Feet.			
1. Schwarzenbronn......	34,000	10,000	44,000	3	....	....
2. Schwarzenberg.......	35,000	53,000	88,000	10	....	....
3. Riesenkopf..........	53,000	....	53,000	....	....	....
4. Mehliskopf..........	....	....	....	....	....	....
5. Grünwinkel..........	318,000	....	318,000	....	....	....
6. Dobelbach............	19,000	19,000	38,000	....	....	4,900
7. Hoher Ochsenkopf...	....	....	....	....	....	....
8. Kleingartenkopf.....	....	....	....	....	....	....
9. Kleingarten..........	257,000	3,000	260,000	12	....	9,500
10. Grossgarten..........	72,000	62,000	134,000	....	....	5,000
11. Sachsenbronn........	163,000	....	163,000	3	....	3,500
12. Gartenbach..........	195,000	7,000	202,000	8	....	3,000
Total............	1,146,000	154,000	1,300,000	36	....	25,900

NOTE.—The excess was due to heavy windfalls; it will not derange future

WORKING PLAN AND OF THE EXECUTION.

Results of Actual Work Done.						Comparison of Proposed and Executed Cuttings.		Remarks.
Cuttings.			Cultivation. Acres.	Draining. Feet.	Road Construction. Feet.	Cut too much. Cubic Feet.	Cut too little. Cubic Feet.	
Final. Cubic Feet.	Intermediate. Cubic Feet.	Total. Cubic Feet.						
33,034	12,549	45,583	4·4	....	....	1,583	....	
54,517	75,000	129,517	5·0	....	....	41,517	....	Excess due to windfalls and snow-break.
132,900	....	132,900	·1	....	....	79,900	....	Excess due to windfalls and snow-break.
....	....	....	....	....	....	....	....	
177,169	....	177,169	·1	....	....	....	140,881	Held back, on account of extra fellings in other compts.
86,606	68,301	154,907	....	....	5,008	116,907	....	Exeess due to windfalls.
....	....	....	....	....	....	....	....	
....	....	....	....	....	....	....	....	
342,444	21,635	364,079	8·4	....	9,679	104,079	....	Excess: windfalls and construction of road.
95,852	....	95,852	....	....	5,299	....	38,148	Thinning held over.
111,049	....	111,049	·9	....	3,691	....	51,951	Held back on account of excess in other compartments
197,660	....	197,660	....	....	2,968	....	4,840	
1,231,231	177,485	1,408,716	18·9	....	26,625	108,716	....	

arrangements, as there is yet a considerable excess of growing stock in the forest.

SOME NOTICES OF THE PRESS DURING THE PAST TWELVE YEARS.

The principle on which the present work in Minnesota is based is that *prevention* of fires is the chief remedy. * * This report is one of the most valuable documents of its kind which has been published. * * It will be widely called for, and gives an object lesson to other parts of the country.—*Boston Herald* (1896).

The annual report of the Chief Fire Warden of Minnesota, Mr. C. C. Andrews, is a document of value to all interested in forestry. As Mr. Andrews says, when people understand the benefits to be derived from a rational management of our forest lands, then, and not till then, will there be a public sentiment that will make the Fire Warden Law as effective as it should be. The attempt which Minnesota is making to prevent forest and prairie fires is indeed a commendable one.—*Outlook* (N. Y.)

Very notable contribution to the literature of forestry.—*American Lumberman.*

Since the establishment of the office the state has been singularly free from destructive fires.—*Minneapolis Lumberman.*

Apart from the importance of the subject, the masterly way with which it is handled makes this report of 137 pages a gem of its kind. This compilation of data represents an immense amount of painstaking labor, on which an active mind and a strong hand has done first-class service.—*St. Louis Lumberman.*

The Fifth Annual Report of the Chief Fire Warden of Minnesota is not exactly a magazine, but it has illustrated pages, it deals with nature, and it is full of information about forests in this and other countries. Don't fail to get this report. It is exceedingly valuable. Here is a chance for the schools to become intelligent concerning our Minnesota forests and concerning forestry generally.—*School Education.*

A most interesting document. * * This movement is full of hope for the future of American forests.—*Chicago Standard.*

The public mind needs to be educated on the subject, and a report like this will have an excellent effect.—*Minneapolis Journal.*

State document of great value.—*Farm, Stock and Home.*

Gives evidence of able and energetic work on his part.—*Popular Science Monthly.*

This document gives a great deal of valuable information. * * The letters sent by the fire wardens and others throughout Minnesota to their Chief in reply to his circular of inquiries are remarkably intelligent and interesting.—*American Architect and Building News* (Boston).

We should like very much to see it duplicated in Wisconsin.—*Eau Claire Leader.*

Exhibits the fact that the Chief Fire Warden is in close touch with the fire wardens in each town in the state.—*Roseau Times.*

The Minnesota law is one of the best and most progressive in force in any of the states.—*Gifford Pinchot, Chief of the U. S. Division of Forestry.*

RESOLVED, As a fundamental proposition of rational forestry, we commend the well-organized effort of the State of Minnesota to suppress forest fires, being aware that no advance can be made in forest management without such protection.—*Resolution adopted by the American Forestry Association.*

Under the vigorous administration of the present Chief Fire Warden much has been done to promote the growth of a correct public sentiment and not a little has been accomplished in the actual prevention and suppression of fires.

Warning notices in great numbers have been posted and the intelligent cooperation of a large force of assistant wardens has been secured. During the drought in the early summer of the present year over 300 fire wardens were in correspondence with their chief, reporting precautions taken, and otherwise showing their interest and activity. The system is doubtless capable of improvement, but in its inception and reasonably successful working a great step has been taken, and by so much Minnesota is well in advance of Michigan and Wisconsin. —*Prof. V. M. Spalding of the University of Michigan, in "Science" for December 28, 1900.*

Minnesota is taking a foremost place among the commonwealths that are giving attention to forestry. The annual reports of General C. C. Andrews, really forestry reports, are of great interest and value.—*Democrat Chronicle*, Rochester, N. Y. (1901).

Preventing fires by careful watching and prompt punishment for law breaking hunters and campers, and also by quick action in stopping incipient fires are the chief means resorted to to protect the forests from conflagration. This sort of work Chief Fire Warden Andrews is doing in Minnesota to as great an extent as is possible with the means at his disposal to do with.—*Farm, Stock and Home*, Minneapolis (1906).

While it is never safe to speak too glowingly of a service that has been performed while there is yet danger of failure, it has undoubtedly been proven that the work of the department of the chief fire warden of Minnesota has been efficient during the years since it was created.—*Mississippi Valley Lumberman* (1906).

[From Gen. Henry L. Abbot, Colonel of Engineers, U. S. Army, retired, one of the commission appointed by the National Academy of Sciences to consider and report a forest policy for the United States and upon whose report the forest reserves were established.]

CAMBRIDGE, MASS., June 29, 1901.

Mr. C. C. Andrews, Chief Fire Warden, St. Paul, Minn. Dear Sir: Please accept my thanks for the copy of your annual report for the year 1900, which has come safely to hand. I need not say how much those who appreciate the value of our forests admire the good work you are doing for their proper treatment.

Yours truly, HENRY L. ABBOT.

For the twelfth time, Minnesota's Prophet of Forestry, Gen. C. C. Andrews, presents to the government and people of the State his annual report. For nearly thirteen years Gen. Andrews has given to the forestry interests of the State the most painstaking and conscientions study; to the protection of its forests against fire, in his capacity as chief fire warden, the most vigilant watch-care. * * * But his service as fire warden, important as it has been, has not paralleled in magnitude that which he has sought to render in the capacity of a public teacher of the principles of forestry. By the conditions of the act creating his office, it was made a part of his duty to "disseminate information concerning forestry." That part of his commission he has interpreted in the terms of the enthusiast—more and more so as the mistakes and wastefulness of the State's policy toward its lumbering interests became clear to him, and he perceived the necessity of providing—in Minnesota, the traditional "home of the pine" and the storehouse of a forest wealth once deemed "inexhaustible"—against a treeless future. He has been indefatigable in traveling over the State as the herald and exponent of a rational forestry. In lectures before schools, colleges and societies; in frequent contributions to the newspapers; in conversation with individuals and in labors before legislative committees, he has presented such an array of facts and figures as should, as the result of his work, have made Minnesota foremost among all the States in its provisions for maintaining its forests and averting an impending lumber famine. His annual reports have been masterly in their presentation of the forest situation here as compared with that in Europe and in other States of our Union, and in their arguments, verbal and pictorial, for the substitution in Minnesota of a wealth-producing for a wealth-destroying system.—*Pioneer Press*, St. Paul, Minn., Aug. 6, 1907.

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Walter Mulford

AUSTRIA

[The following sketch of Forestry in Austria was kindly furnished (in German) by the Austrian Government through the good offices of the American legation at Vienna, but too late to be printed in its proper place in the Forestry Commissioner's 16th Report.]

I. STATE FORESTS.

For a better understanding of the following discussion, it must be taken for granted that the administration and management of forests, which belong to the state, and to religious and other funds, are entirely separate from the state's control of all forests, no matter to whom they belong, and that both branches of the state forest service are taken care of by separate bodies of officers.

In this discussion "state forests" are understood to be of the first class.

The area of the state and fund forests is 3,742,499 acres, of which 896,132 acres are unproductive. The elevation of the forests above sea-level is an unusually varying one. Two and six-tenths per cent of the forests are located on a sea-level of from 1 to 300 meters (1 meter equals 3.281 feet), 14.1 per cent at an altitude of 300 to 600 meters, 27.7 per cent from 600 to 1,000 meters, 42.4 per cent from 1,000 to 1,500 meters, and 13.2 per cent are located at an altitude above 1,500 meters.

On account of the diversified geological conditions of this half of the Empire and the fact that state and fund forests are divided into more or less large estates, it is difficult to say anything definite about the character of the surface and soil and the prevailing kinds of trees. In the western part, the forests stand on triasic limestone and crystallic slate, likewise in the northwest. In the "Wiener Wald" and in the eastern part of this half of the Empire, Galizia and Bukowina, upon sandstone of chalk and eozoic formation, in places dating back to the neogenic and the earlier periods. The principal kinds of trees are the European spruce (*picea excelsa Link*), silver fir (*abies pectinatia D. C.*), Scotch pine (*pinus silvestris*) and beech (*fagus sivatica L.*)

The annual yield in round numbers is 3,400,000 cubic meters; in that figure are included 1,800,000 cubic meters of timber and 1,600,000 meters of firewood. The waste material, such as branches and twigs, can be placed approximately at 600,000 cubic meters.

The age for cutting spruce and fir on the better soil of the lowlands is 90 years, on a medium elevation 100 years, and on high lands 120 years. Both kinds of wood have an average diameter of 15¾ inches at this age (measurement is taken breast high).

A difference between fir and spruce, when the general average is taken into consideration, is not noticeable; however, the fir under favorable conditions remains solid for a longer period than the spruce tree.

Timber on the state and fund forests is either sold standing on the basis of an average yield or it is sold after measurement. The first method is rarely used at the present time. Only the remote mountain regions of Galizia and Bukowina make use of this method of disposition. The sale of measured timber is at public auction or through written bids. Private sale is only in special cases.

The expenses for the administration and management of the state and fund forests in Austria, including costs of reforestation and of delivery, averaged for the years 1904 to 1908, eighteen million crowns: i. e., $4,365,000 per year (1 crown equals 24¼ cents). In this sum are included the expenses connected with the running of the four state forestry schools. The sums expended on the other forestry schools, especially the (royal) High School of Soil-Culture in Vienna are not included in this sum. The cost of purchasing large estates, which occurs rarely, is not included in the above named sum.

The yearly receipts from the state and fund forests in the same period from 1904 to 1908 amounted to approximately $6,693,000. After subtracting the expenses mentioned above, this leaves a profit of $2,328,000 per year.

In cutting timber, clear-cutting is mostly practiced. Reforestation is effected as a rule by artificial planting. Taking a five-year average, 8,155 acres are annually planted.

Pine plants are generally set out at an age of two years, spruce at three years. Plants are set at a distance of 1.5 meters from one another and 1.5 meters distance between rows; this makes approximately 1,820 plants per acre.

About twenty people are employed per acre, and generally for every ten women and children one man is employed. Expenditure per acre, without including cost of planting materials, amounts to about $4.85.

Nothing definite can be said about damage done by fires. Suffice to say that the loss is a small one and not worth mentioning. Means taken to prevent fires are the maintaining of cleared areas and ditches along railroads and the appointing of fire patrol men in a dry season. The fire extinguishing apparatus is used at times, especially when the fire is localized.

According to the Austrian forestry law, all the surrounding neighborhood can be called for the purpose of extinguishing a fire; these people may be summoned by the owner of the forest, or by forest officials or by the superintendent or manager of a forest estate. The persons summoned must hurry to the scene of the fire with such necessary materials for extinguishing fires as cramps, hoes, shovels, picks, water buckets and the like. Superintendents and forestry officers are to accompany these fire fighters. Those not obeying the summons to fight fire are subject to punishment by fine or arrest. The services rendered are paid for in the accustomed way.

The forest law compels everyone who comes across an abandoned or unquenched fire to extinguish it as much as is possible for him to do, or if it is a forest fire to report it to the nearest house. Further, the law compels all those who use fire in or near a forest to exercise the greatest care; should any damage result from such a fire the one responsible is made to pay for the damage done. Whenever the customary law of punishment is not directly applicable the offender can, according to the forest law, be punished by fines, ranging from $5 to $20, or by imprisonment from 1 to 8 days. The law prescribes further that whoever kindles a fire and leaves it without having completely quenched it, shall be punished for this offense by imprisonment from 1 to 7 days, and in extreme cases this time may be increased.

The state and fund forests of Austria are divided into forestry administration districts over which is placed an educated forester. The average size of such a district is about 19,210 acres. The officer in charge of such a district is called "forest and domain administrator." These men can, after a certain number of years' service, be advanced to "forest masters" and "forest councillors."

The salary of these officers begins with $679.00 (forest and domain administrators) and rises to $1,552.00 (forest councillors) per year. Besides this, all officers receive additional incidental expenses varying with the locality in which they are employed. The pension salary after a continual service of ten years amounts to 40 per cent of the salary, and for every additional year of service up to the thirty-fifth 2.4 per cent of the salary is added to the 40 per cent, plus the decreased incidental fees of $97.00 for "forest and domain administrators," $116.40 for "forest masters," and $135.80 for "forest councillors."

The higher officials directing the forest and domain officers and those in the ministry of agriculture are called "Oberforsträte" and "Hofräte." The former receive a salary according to their former rank plus the highest incidental allowance (the highest allowance is given those men stationed at Vienna). Their salary ranges from $1,998.20 to $2,580.20. The latter class of officials according to the same standards receive a salary from $2,958.50 to $4,028.50.

The state forestry officials receive their education in the Royal High School for Soil Culture at Vienna, at which school the course covers a period of four years. In the year 1909-10 there were on the average in the winter and summer semesters 505 students enrolled. The men for minor offices, such as technical help and patrolmen, are educated in the four government forestry schools. These schools are connected with forest and domain administration districts and have an average attendance of fifty.

The results of the extensive observations concerning the effect of forests upon climate and rainfall can be summarized by saying that forests on the one hand increase the rainfall—although in a smaller degree than was formerly believed. On the other hand, forests act as a regulator for the water in the ground. Through shading and decreasing the strength of winds forests lessen the quick drying of the soil and increase its capacity for holding water. At the same time, on account of the mass of living and rotting material in the ground, the movement of water is made easier and the formation and feeding of streams is noticeably promoted. In a dry season the forests are able to give up water to the streams, and in a wet season the forests hold back the water and give it up gradually. The latter benefit is of especial importance in mountain regions where forests prevent the sudden drain of a large quantity of water, thus preventing the washing away of humus and the overflows into valleys and settlements.

II. PRIVATE FORESTS.

The state has no control over the amount of the annual yield, nor over the use or disposition of the kinds of wood or other forest products of private forests.

For the purpose of protecting private forests and all other remaining forests there is an institute of technical forest bureaus, which bureaus, having the management of the lawful forest regulations, are joined to the accredited public boards. These bureaus have as their duty the encouraging of boards in the carrying out of forestry measures and aiding in forest protection, especially to give technical advice and continually observing forestry conditions and giving notice of disobedience of the law.

It is their further duty to aid needy owners of forests and assist them in bringing about scientific improvements which will better forestry conditions. In special cases these bureaus take over the entire management of certain forests. It is also their duty to attend to hunting and fishing regulations.

In order to further forestry culture the state grants considerable assistance in the form of money and also by furnishing the necessary planting materials for reforestation.

Road and white pine in vicinity of Douglas Lodge (the State's Hotel), Itasca State Park.

FORESTRY

SIXTEENTH ANNUAL REPORT

OF THE

FORESTRY COMMISSIONER

(FORMERLY CHIEF FIRE WARDEN)

OF

MINNESOTA

AS REQUIRED BY CHAPTER 22 OF THE REVISED LAWS OF MINNESOTA, 1905.

FOR THE YEAR 1910

ST. PAUL, MINN.
Printed by the Pioneer Co.
1911

STATE OF MINNESOTA,
OFFICE OF FORESTRY COMMISSIONER,
ST. PAUL, APRIL 8, 1911.

Hon. S. G. Iverson, State Auditor:

SIR: As required by Section 3 of Chapter 22, Revised Laws of Minnesota, 1905, I have the honor to submit, herewith, my annual report for the year 1910.

Very respectfully,
C. C. ANDREWS,
Forestry Commissioner.

SIXTEENTH ANNUAL REPORT

OF THE

FORESTRY COMMISSIONER

OF MINNESOTA.

My Special Report of the 18th of January last on the forest fires of 1910, is herewith repeated and occupies pages 3-40 of this report:

SPECIAL REPORT.

This report is made at this time to furnish information for the use of the Legislature now in session.

According to the U. S. Weather Bureau's report, the year 1910 was the driest in Minnesota of any year of which there is a record. On account of protracted and extreme drouth in Northern Minnesota, the year 1910 has been the most dangerous in respect to forest fires that has occurred.

According to the reports of local fire wardens, forest fires occurred in 29 different counties, and in 395 townships. The number of acres more or less burned over was 1,051,333, but mostly cut-over land. The amount of damage—rough estimates—was $1,721,752. This damage does not include loss of property in the villages of Baudette and Spooner, figures for which I have not yet been able to procure. The number of fire fighters was 15,260, but this large number arises from the names of same persons being reported as rendering service at repeated fires. The number of fire fighters whose verified accounts for fighting fire have been received is 8,944, and the aggregate amount of their unpaid accounts is $94,507.31. Where the service was rendered in organized towns, the accounts have been approved by the town board.

This is a large amount, and it is to be hoped that no such large amount for similar service will ever occur again. But it is only about half as much as was incurred in the State of New York just for fighting forest fires in the spring of 1903, and in a territory less than the forest fire area in Minnesota. The legislature of New York in 1904 appropriated $93,000 as the state's share of the expense of fighting forest fires in the spring of 1903, and the towns in which the fires occurred paid, in the aggregate, an equal amount.

The unpaid service of these 8,944 Minnesota people in fighting fires was legally commanded by the fire wardens. In most cases they left their own, to them important, work, to render this public service. They sometimes went many miles from their homes. They saved settlements, human life and property from destruction. This work was sometimes at the peril of their own lives.

Many of these people have been waiting six months for their pay, and an appropriation for the purpose should be made at an early day.

I asked of the last legislature a total appropriation of only $38,000 for forest preservation service, and if that amount had been appropriated, I could have continued the ranger service longer—it had to stop August 31st for lack of money—and doubtless prevented many of the fires, but only $21,000 was appropriated.

NEED OF EARLY LEGISLATION.

The thousands of settlers in the forest regions of Minnesota should not be made to live in fear and terror of forest fires. The dignity and humanity of the State demand that every reasonable means of protection be provided. The coming season may be dry. Forest fires the past year began as early as March. The campaign for the prevention of fires ought to begin in March. Whatever permanent plan may be finally adopted for the organization of the forest service, there is need of immediate legislation and appropriation of money to prepare for the spring campaign, and some proposed amendments to the present forest fire law are herewith submitted.

BAD FOREST FIRES IN PREVIOUS YEARS.

In the past forty years deplorable calamities have occurred in the lake states from forest fires.

The proclamation of Governor Fairchild stated that the loss of life in the forest fire of October, 1871, in Wisconsin, was at least 1,000, and that 3,000 persons were left homeless. Private contributions for relief which had been received at the executive office alone up to the end of 1871 exceeded $166,000, and the loss of property by the fire was estimated at $3,000,000. Ten years later the fire in southeastern Michigan, September, 1881, caused by settlers burning brush, ran over 48 townships, burned to death 138 people, rendered hundreds of families homeless and destroyed over $2,000,000 of property. The money and supplies contributed for relief exceeded a million dollars. By the forest fire near Phillips, Wis., July, 1894, thirteen people perished. In the Hinckley, Minn., forest fire, September 1, 1894, 418 people perished and the relief furnished to 2,045 sufferers amounted to $184,744.

HINCKLEY FIRE RESULTS.

At the time of the Hinckley fire Minnesota had a law making it a misdemeanor to set on forest or prairie land fire that endangered the property of another, but there was no particular system for its enforcement. The Hinckley disaster led to making town supervisors fire wardens with a central directing officer, called chief fire warden, but since 1905, forestry commissioner, with the trivial expenditure by the state of only $11,000 a year. Under this system and with an area of 18,000,000 acres where the pine had its home, with increasing risks from the activities of new settlements, logging and mineral industries, campers, tourists and hunters, and notwithstanding many dry seasons, the average annual loss by forest fires, according to fire wardens' reports during the thirteen years from and including 1895 to 1908, when the Chisholm fire occurred, was only $30,000. During that

We must remember that the forests of Minnesota are worth $100,000,000, and that they increase in value by growth at the net rate of two per cent per annum, or $2,000,000 a year. The $21,000 appropriated annually for protecting these forests from fire is scarcely enough for effective work in any one out of eight large counties requiring fire warden service. [The amount of money appropriated by the United States for the administration of the Minnesota National Forest, Cass Lake, comprising about 300,000 acres, or one-third the size of Pine county, during the present fiscal year is $24,433.]

Minnesota has been criticized by the press of the entire country for its parsimony. A costly tuition has taught us that we must have more stringent laws for the prevention of fires, and more money for their enforcement. The careless use of fire that has been habitual in the forest regions of our northwestern states would not be permitted in a country like Germany.

Fires Set by Railroads.

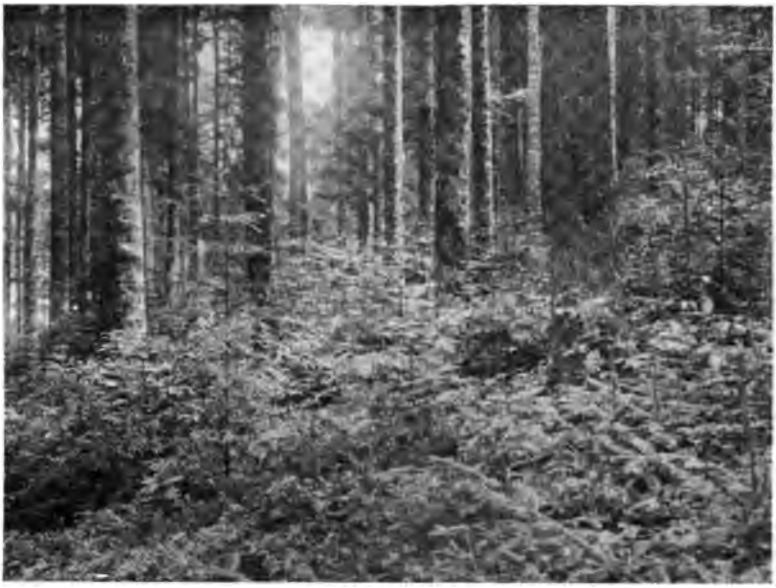
A large per cent of the forest fires are set by sparks from railroad locomotives. There are in Minnesota in round numbers 2,000 miles of railroads, including logging roads in the forest regions. Locomotives equipped with the best spark arresters will, on an up-grade with heavy train, emit sparks; hence our law of 1909 required railroad companies to employ patrols in 'a dry season." Instead of complying with this, the law was contested by railroad companies, and three district judges of the fifteenth district held that the words 'dry season" were too indefinite and the law invalid. The prosecutor in criminal cases cannot appeal, and the state has been unable to have the law construed by the supreme court. Our remedy must be to copy the New York law of 1909, which requires railroad companies operating in forest regions to maintain an efficient fire patrol from April 1st to November 1st, and if they fail to do so, then the state shall do it and the railroad companies pay for it. At present, railroad companies pay in the aggregate large amounts for damages caused by fires they set. Forest fires discourage new settlers from going upon the vacant lands. It is for the best interest of such companies to take more pains than they have hitherto done for the prevention of such fires along their lines.

Suggestion has been made that railroad locomotives could use fuel oil, but a letter I received under date of Altoona, Pa., December 9, 1910, from Mr. A. W. Gibbs, General Superintendent of Motive Power of the Pennsylvania Railroad Company, states: "I should say that for this locality and for the Northwest, fuel oil would be scarcely practicable for use on locomotives, on account of the distance of the source of supply from the point of consumption."

BURNING SLASHINGS.

In 1905 I presented to the legislature a bill that had been drawn with the assistance of the best legal talent in St. Paul, providing that if those who cut wood and timber for commercial purposes did not burn the slashings the state would do it and the expense be a lien on their property; but the opposition to it was too strong. I firmly believe that if it had been passed and enforced, neither the Chisholm nor Baudette calamity would have occurred.

I presented evidence to the forestry committees of the last legislature that under the regulations of the Interior department of the United States, slashings from winter logging in the Minnesota national forest were successfully burned at the time of cutting; but at the earnest request of representatives of logging companies, the bill which I had prepared was amended to read, "Said burning shall be done as soon as practicable at a time when it can be done without danger and before the first day of May next following." But this law has not proved successful, and it is necessary to enact a law requiring branches to be lopped from the tree and burned at the time of cutting by piling them upon a fire, where the logging is between November 1st and April 1st. All laws should be admin-



In the Black Forest near Freudenstadt Wurtemberg. Spruce and fir forest. About 130 years old thinned out to .5 cover. Thick growth of young fir ready to free.

A lumber camp in Northern Minnesota. Logging companies could do much good example in keeping the ground around their buildings, in the forest, tidy and safe i of fire.

istered with common sense, and with a spirit of justice, and it is to be hoped, in view of the sad experience we have had, timber producers generally will support such a law and give it a fair trial. There must be some spirit of sacrifice all around if we are to succeed in averting the terrible forest fires that discredit our civilization.

It is not from distrust of lumbermen that we wish a rigorous law, but it is because there should be no chance for anyone to evade the law. The proposed law makes a concession to lumbermen in not requiring the burning of hardwood slashings, that being more difficult than the burning of coniferous slashings.

EXPERIENCE HAS NOT SHOWN THAT A GENERAL SLASHINGS LAW IS IMPRACTICABLE.

The first law in this country requiring the burning of slashings was the (Morris) Act of Congress of June, 1902, drawn by Gifford Pinchot, regulating logging on the Chippewa Indian lands in Minnesota, including the Minnesota National Forest, and which requires purchasers who cut pine timber "to burn or remove a sufficient amount of the tops and refuse to prevent danger from fire to the timber left standing." This law has successfully been complied with. To carry out this law, the Superintendent of Logging employed by the Interior Department issued regulations under date of Cass Lake, Minn., Sept. 25, 1908, as follows:

"On and after the first day of October, 1908, all brush shall be burned at the time of cutting, excepting that cut during the months of April, May, June, July, August, September and October, which shall be piled at the time of cutting, and burned at that time if the weather and conditions permit, and if not, at such time as it shall be safe to do the burning without danger of forest fires. * *

"I would refer those purchasers who have done no burning in the winter to Goss & Sons, Cass Lake, Minnesota, Joseph Gibson Company, Deer River, Minnesota, Sam Simpson, Bena, Minnesota, and George Cochran, of Cass Lake, all of whom have been logging on ceded lands for the past four years."

These instructions were approved by the Interior Department, November 2, 1908, and are still in force.

The only other law requiring the burning of slashings (neither Michigan nor Wisconsin has tried such a law) was the law of Minnesota enacted two years ago. As stated above, the bill as first drawn, and as the Forestry Commissioner wished to have enacted, required the burning at the time of cutting. It was the logging companies themselves who asked a change of the wording, so as to permit delay in burning. There were some who lived up to the law in good faith and had no difficulty in doing so. Others waited too long and then undertook to burn in dangerous weather. Probably a majority ignored the law altogether. The Forestry Commissioner did not have the money to enforce it.

Under these circumstances, I do not think it can be said that experience has shown that a general slashings law is impracticable.

Instead of a general slashings law, it is suggested that the Forester be given authority to "order the disposal of dangerous slashings." This would shift responsibility upon the state. With a thousand people cutting timber over a region two hundred miles in length, from Grand Portage to the Red River Valley, and a hundred miles wide, with ever so many faithful patrols and rangers to assist the Forester, there would be some dangerous slashings left unburned.

We must assume that a general slashings law would be enforced in a reasonable manner. There might be a clause in the bill permitting the Forester to dispense with burning where in his judgment such burning would be impracticable and unsafe. Yet such a clause would likely entail a great amount of correspondence and by delay give the ill-disposed excuses for evading the law.

AUTHORITIES ON BURNING SLASHINGS.

Dr. Richard Hess, Professor of Forestry at the University of Giessen, in Hesse-Darmstadt, in his work on forestry as translated from the German in Schlich's

Manual, Vol. 4, "Forest Protection," page 551, says: "The felling areas should be *rapidly* cleared of all refuse, and the produce of the thinnings also removed *quickly*, especially in the case of faggots from coniferous trees." That is the doctrine of all forestry authorities, and it is the practice strictly followed in the management of all state forests in Europe.

Mr. Henry S. Graves, at the head of the U. S. Forest Service, in Bulletin 82, pages 20 and 21, on the "Protection of Forests from Fire," as printed in the September and October numbers of "American Forestry," says:

"The presence of dry tops and piles of brush in the forest constitutes the *greatest* menace from fires. The severity of a fire, and hence the damage done, is in direct proportion to the amount of dry debris on the ground. * * * The most economical method of destroying brush and debris produced in lumbering is to burn it as the logging proceeds. This is possible when the ground is covered with snow or is so damp that fire will not spread. * * * Small fires are started, and as the branches are cut off the trimmers throw them on the nearest fire. * * * In coniferous forests the tops burn readily, even on the snow or in stormy weather."

This further remark of Mr. Graves is perfectly true: "In many cases the high cost of brush disposal has been simply due to the fact that the men who were doing the work were inefficient, *unwilling* or unskilled."

AN INTELLIGENT LUMBERMAN'S OPINION ON BURNING SLASHINGS.

In an address delivered six years ago at the American Forest Congress in the city of Washington, Mr. F. E. Weyerhaeuser of St. Paul said:

"The next obstacle, more important because harder to overcome, is fire. I am frank enough to say that in this matter lumbermen themselves are largely responsible, sometimes even to the extent of fighting reform. For example, two years ago a bill was proposed in Minnesota providing for the burning of slashings. Because of the opposition of the lumbermen it was never reported out of the committee. Since then the Government has required the burning of slashings on the Leech Lake Indian Reservation. The wise and moderate regulations suggested by the Bureau of Forestry were introduced with complete success. It was a splendid object lesson. A wisely drawn bill presented to the legislature to-day would be supported by the best lumbermen."

Of course, we all want a wisely drawn bill. If everyone who makes slashings was as well disposed as Mr. Weyerhaeuser, a very moderate law would be wise. But there are many people engaged in cutting timber who are unwilling to comply with any law for the burning of slashings, and who would take undue advantage of a mild law. It would seem therefore that a strict law, which can easily be enforced, would be a wise law.

FIRES SET BY SETTLERS.

Every good citizen wishes to promote the welfare of the new settler who in good faith tries to make a home in the forest wilderness. The state in some localities has not yet done its duty towards such settlers nor promoted its own best interest in the matter of main roads. There is an almost overpowering temptation for many settlers whose land is incumbered with brush to set it on fire in very dry weather. The yielding to such a temptation, however, has caused many bad forest fires. Many a poor settler has lost all his hay by the over-confidence or negligence of a neighbor in the use of fire in dry weather. But there must be change; and I recommend a provision of law that from April 15th to November 15th no one shall set fire to brush, stumps or meadows in the forest regions without first making a fire-break of bare earth a rod wide between the place of fire and the property of another.

THE LAW OF MOSES.

The law proclaimed by Moses over three thousand years ago was this: "If fire break out and catch in the border of standing corn and the field be consumed, he that kindled the fire shall surely make restitution." If the wrong-doer had no property, he was obliged to make compensation by his labor. Our law is much milder. It is not one case in twenty with us that a man whose negligence causes damage by fire makes restitution. Our Minnesota law exempts from execution a man's dwelling, eighty acres of his farm, and more live stock and other property than the average resident of the forest regions possesses. Under such circumstances, to require a man who sets fire between May first and November 15th to make a fire-break a rod wide of bare earth, between the place of fire and the property of another which might be endangered, is not unreasonable.

RANGERS AND PATROLS.

The twenty-six rangers employed from June 1st to September 1st proved in most instances useful. They were successful in securing quite a number of prosecutions and convictions for violation of the forest fire laws. It is seldom a local warden is willing to prosecute a fellow townsman. There are 800 townships in which ranger or patrol service could be useful in very dry weather. If one ranger had charge of only ten townships it would require 100 rangers. The expense of adequate patrol and ranger service will be over $100,000 a year. If we could find a George Washington in every township who would be willing to serve as fire warden or patrol, the problem of forest fires would be solved. Your ideal man who has the energy, courage and honesty to make a thoroughly efficient ranger or patrol is not so easily found. It requires very good pay to secure the services of such a man. Of course, all appointments in the forestry service should be solely for fitness and without regard to party adherence.

TERRITORY REQUIRING PATROLS OR RANGERS.

I submit a list of townships in various counties which require patrol or ranger service; but I omit from the list territory in as many as fifteen prairie or forest counties which at the beginning of our system had fire warden service, but now do not require it. Even in some of the timber counties in the following list there are occasionally townships containing so little valuable timber that one at first thought would say they do not require patrol or ranger service; but it must be remembered that forest fires sometimes run thirty miles, and often get their start in just such towns.

Following is the list:

COUNTIES	NO. OF WHOLE TOWNSHIPS	No. Fractional Twps.
Aitkin	44	8
Becker	10	
Beltrami	70	15
Carlton	24	
Cass (South of Leach lake)	37	9
Clearwater	28	
Cook	19	18
Crow Wing (North of Brainerd)	20	5
Hubbard	26	
Itasca	71	10
Koochiching	81	18
Lake	36	15
Mahnomen	8 E. of R. 40	
Marshall	20 E. of R. 44	
Norman	12 E. of R. 46	
Pine	29 T. 41 and North	
Polk	12 E. of Erskine	
Red Lake	17 E. of R. 43	
Roseau	43	
St. Louis	156	13
Wadena	15	

Whole townships..780 Fractional townships 103

The 103 fractional townships equal 50 whole townships.

Total townships requiring patrol or ranger service, 830.

Assuming that one patrol or ranger can take care of four townships (92,160 acres), it will require 207 for fully six months in such a year as 1910. In about half of the townships his service would be required in the winter to enforce the slashings law. Any poor fellow in need of a job cannot face the well-to-do settler or logger who intends to have his own way. Cheap men will be worse than none. We must have for such service quiet, sensible, energetic and honest men who would be respected, and it will not be easy to find them. It will require on an average $625 a year for the compensation of each ranger or patrol having charge of four townships.

Their main duty will be to *prevent* fires. Where necessary and practicable they should construct fire lines (good roads are the best fire lines) around valuable standing timber belonging to the state; also, under direction of the state forester, burn any existing slashings that endanger settlements, villages or public or private property.

APPROPRIATION.

I recommend the following item:

To pay the compensation and expense of patrols and rangers, and for making necessary fire lines, lookouts and telephones and for help in suppressing fires, there is hereby annually appropriated out of any money in the treasury not otherwise appropriated the sum of two hundred thousand dollars, or so much thereof as shall be necessary.

The moral effect of a sufficient appropriation will be immense, for it will be notice to the public that the state means business.

Accidents may happen. We cannot say that even the passage of this bill will surely prevent another such calamity as we suffered this year, but there is the highest probability that it will. Anyhow, if the bill be passed the legislature will have done its duty; and Minnesota will have done more for the prevention of forest fires than any other one state in the Union.

FIRE WARDENS.

As town supervisors are frequently changed, I believe it would be an improvement of our present system to appoint permanently in each town, as fast as we can find a suitable man, one warden or patrol to take the place of

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the three supervisors and town clerk, who now are ex-officio fire wardens. If we could find such a man in each town, then would arise the question of wages. If he paid his own expenses it would be necessary to pay him $3 a day. Watching against fires in dangerous weather and enforcing the slashings law in winter might require sixty or more days of time. A real valuable man for such duty would prefer to stick to his farm.

PROSECUTIONS.

The forest fire laws will not be respected unless enforced. The state cannot keep a watchman over every heedless person in the forest regions. Examples must be made of those who violate the law, so that others will be restrained from negligence in the use of fire. While there have been praiseworthy exceptions, as a rule the county attorneys have proved but little help in prosecutions under the forest fire laws. The incapacity of local magistrates is an obstacle in securing convictions. The advantage of penalties being under $100 is in having speedy trials before local magistrates. If the penalty were above $100, the case would go to the district court and be attended with considerable delay. The present appropriation for prosecutions is $2,000 a year. But it is not enough for any one of ten counties that could be mentioned. We must pay responsible men for promptly looking up evidence and capable attorneys for conducting prosecutions.

While conciliatory methods to secure the exercise of care and compliance with the law must be foremost, it is, however, absolutely necessary that there be ample means for making the law respected. We might as well have no law unless it is going to be enforced. For promptly fixing responsibility of negligence in causing fires, instituting prosecutions and paying for competent attorneys who will be a match for those employed by logging and railroad companies, there should be an annual appropriation of $30,000.

CENTRAL OFFICE SHOULD BE REINFORCED.

If the legislation indicated prevails, it will require considerable additional office force to attend to correspondence and supervision incident to the ranger, patrol and warden service; watching that a thousand different firms or individuals live up to the slashings law; that 2,000 miles of railroad are patrolled and prosecutions instituted and carried on with energy against violators of the law. The forestry commissioner's office must be strongly reinforced, and not with cheap men.

SUMMARY OF FOREST FIRES, 1910.

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
Aitkin County—					
Aitkin	June 21	600	......	25	R. R. locomotive.
Aitkin	Aug. 19	640	......	22	Campers.
Aitkin	Sept. 17	3,000	1,500	75	Unknown.
50-23	Aug. 26	10	none	11	Campers.
Beaver	May 6	40	150	18	Unknown.
Beaver	May 13	240	200	37	Clearing land.
Beaver	July 2	640	100	19	Unknown.
T. 45-23	May 6	500	600	30	Unknown.
Clark	June 1	300	......	20	Unknown.
Clark—48-22	July 4	5,000	500	20	Unknown.
Clark	April 10	1,000	50	30	Burning meadow.
Clark	July 22	30	none	4	R. R. locomotive.
Clark	Aug. 10	600	130	14	R. R. locomotive.
Clark	Oct. 12	3,000	250	......	Clearing land.
Cornish	Oct. 15	1,000	......	3	Unknown.
Davidson	June 18	5,000	1,000	8	R. R. locomotive.
Dick	Oct. 17	1,000	200	14	Unknown.
Fleming	July 1	500	......	7	Unknown.
Fleming	July 15	3,000	......	28	Ditching engine.
Glen	July 30	400	......	13	Unknown.
Haugen	May 5	400	500	7	Unknown.
Haugen	May 14	70	300	6	Clearing land.
Haugen	July 5	320	200	14	Unknown.
Hazelton	May 12	3,000	......	5	Unknown.
Hill Lake	May 4	700	300	9	Campers.
Idun	July 30	11,000	2,000	200	R. R. locomotive.
Idun	Sept. 10	3,000	5,000	......	R. R. locomotive.
Jevne	April 11	1,000	1,000	15	Unknown.
Jevne	June 15	600	60	14	R. R. locomotive.
Jevne	June 19	1,000	200	......	R. R. locomotive.
Jevne	June 30	200	1,000	12	Unknown.
Jewett	April 30	360	800	9	Unknown.
Jewett	June 5	40	500	9	Unknown.
Jewett	June 19	40	400	8	Unknown.
McGregor	June 15	4	......	......	R. R. locomotive.
McGregor	July 16	800	300	7	R. R. locomotive.
McGregor	April 10	15	slight	13	Unknown.
McGregor	May 10	40	300	9	Campers.
McVille	May 11	200	300	5	Ditch engine.
Malmo	May 10	1,000	5,000	2	Unknown.
Millward	May 16	300	600	......	....
Millward	Sept. 10	30	100	11	Clearing land.
Millward	May 5	500	200	11	Unknown.
Millward	May 13	120	200	2	Unknown.
Millward	June 10	100	200	12	R. R. locomotive.
Millward	Sept. 19	300	1,500	6	Unknown.
Millward	Oct. 15	500	......	100	R. R. locomotive.
Morrison	July 20	3,000	......	......	Dredging engine.
Morrison	Sept. 30	3,000	1,000	3	Unknown.
Nordland	June 14	15	25	3	Clearing land.
Nordland	July 18	1,300	200	20	Unknown.
Pliny	April 8	600	300	......	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
Aitkin County—*Cont.*					
Pliny	May 2	1,000	100	7	Unknown.
Pliny	May 6	3,000	10,000	79	Hunters.
Pliny	July 30	1,000	......	......	Clearing land.
Pliny	Sept. 20	1,500	......	......	Clearing land.
Rice River	May 9	100	300	28	Unknown.
Rice River	Aug. 4	20	15	25	Unknown.
Seavey	May 3	280	200	6	Unknown.
Salo	May 10	200	500	30	Unknown.
Salo	May 3	10	175	11	Unknown.
Salo	June 10	8,000	3,000	32	R. R. locomotive.
Spalding	May 10	2,000	1,000	5	Unknown.
Spalding	June 5	40	......	20	R. R. locomotive.
Spalding	June 22	80	50	3	R. R. locomotive.
Spencer	Sept. 31	50	100	13	Unknown.
Spencer	Oct. 7	480	1,000	5	From adjoining town.
Spencer	Oct. 16	8,000	300	30	R. R. locomotive.
Verdon	Oct. 15	400	100	......	Clearing land.
Wagner	Mar. 24	3	......	11	Travelers.
Wagner	April 4	1,500	2,000	22	Clearing land.
Wagner	Sept. 22	100	50	8	Unknown.
Wealthwood	July 19	400	100	2	Unknown.
Williams	May 1	1,200	100	45	Unknown.
Williams	July 29	400	200	13	Unknown.
Workman	June 22	1,200	2,500	34	R. R. locomotive.
Workman	June 29	2,000	75	33	Unknown.
Anoka County—					
Oxford	April 7	200	200	6	Unknown.
Becker County—					
Carsonville	Aug. 21	1,000	1,200	33	Unknown.
Green Valley	June 19	100	10	11	Unknown.
Green Valley	June 30	40	100	4	Unknown.
Green Valley	June 30	45	10	6	Campers.
Green Valley	Sept. 20	10	none	4	Campers.
Hamden	Oct. 16	300	120	10	Burning fire break.
Height of Land	April 3	3	75	10	Unknown.
Height of Land	May 13	40	slight	......	Unknown.
Height of Land	Sept. 1	2	40	4	Campers.
Holmesville	Oct. 7	600	1,500	45	Burning brush.
Osage	July 1	100	100	5	Unknown.
Silver Leaf	Aug. 19	6	120	14	Unknown.
Two Inlets	May 5	140	......	25	Unknown.
Two Inlets	May 6	700	100	25	Unknown.
Two Inlets	May 6	1,500	1,000	5	Unknown.
Two Inlets	May 14	300	none	14	Unknown.
Wolf Lake	Aug. 26	40	5	27	Sparks from stove pipe
Beltrami County—					
Alaska	May 10	15	200	3	R. R. locomotive.
Alaska	May 12	160	......	4	Unknown.
Battle	June 30	200	50	34	Unknown.
Battle	Oct. 10	2	none	6	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Beltrami Co.—*Cont.*					
Battle	June 28	1,000	1,075	20	Tobacco pipe.
Baudette	July 19	500	2,500	28	Unknown.
Baudette	June 28	......	......	28	R. R. locomotive.
Bemidji	May 4	450	300	13	R. R. locomotive.
Bemidji	May 13	600	500	7	Unknown.
Bemidji	June 24	100	30	6	Cigar or match.
Bemidji	July 22	600	100	100	Unknown.
Birch	July 1	200	500	6	Unknown.
Blackduck	May 11	120	300	11	Unknown.
Blackduck	May 12	2,000	1,000	16	Unknown.
Blackduck	June 29	120	30,000	50	From previous fire.
Blackduck	June 30	3,000	20,000	26	Unknown.
Blackduck	July 1	3	none	10	Clearing land.
Blackduck	July 21	30	none	6	From previous fire.
Blackduck	July 21	80	500	12	Unknown.
Blackduck	Oct. 7	800	5,000	30	R. R. locomotive.
Buzzle	Aug. 20	60	25	8	Unknown.
Chilgren	June 29	8,000	10,000	30	Unknown.
Chilgren	Oct. 7	2,000	10,000	37	Clearing land.
Eckles	May 8	1,000	1,000	9	Burning brush.
Eckles	May 14	600	180	20	R. R. locomotive.
Eckles	June 25	500	400	8	Burning brush.
Eckles	June 27	400	300	50	R. R. locomotive.
Eckles	July 1	80	24	24	Unknown.
Eckles	July 22	30	none	19	R. R. locomotive.
Eckles	July 29	400	600	10	R. R. locomotive.
Eland	May 12	2	none	2	Unknown.
Eland	Aug. 31	6	5,000	9	Unknown.
Frohn	June 17	40	5	2	Unknown.
Frohn	July 1	340	500	17	Unknown.
Frohn	July 15	300	100	3	Campers.
Grant Valley	June 19	40	30	2	Unknown.
Grant Valley	July 17	200	......	7	Unknown.
Grant Valley	Aug. 5	20	......	3	R. R. locomotive.
Gudrid	July 19	740	7,000	78	Burning brush.
Gudrid	July 28	160	500	18	Burning brush.
Hagali	May 4	250	......	5	Unknown.
Hagali	May 15	120	......	5	Unknown.
Hagali	July 1	15	......	2	Unknown.
Hagali	July 3	100	1,000	7	Unknown.
Hagali	Aug. 20	300	200	6	Unknown.
Hagali	Oct. 7	400	1,000	15	Unknown.
Hagali	Oct. 9	500	300	5	Unknown.
Hagali	Oct. 11	300	200	13	Unknown.
Jones	Sept. 1	4	100	6	From adjoining town.
Kelliher	May 6	300	none	15	Unknown.
T. 163-33	July 1	160	50	20	Unknown.
T. 163-33	Oct. 12	20	......	......	Unknown.
Lammers	June 29	400	......	18	R. R. locomotive.
Lammers	Aug. 18	80	......	9	Unknown.
Lammers	Sept. 16	40	none	4	R. R. locomotive.
Langor	June 30	900	2,000	7	From adjoining town.
T. 150-32	May 6	400	slight	6	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Beltrami Co.—*Cont.*					
Lee..............	Aug. 28...	700	400	50	Unknown.
Lee..............	Oct. 2....	5,000	slight	2	....
Liberty..........	July 4....	200	75	7	Making smudge.
McDougal........	Sept. 30..	10,000	50,000	100	R. R. locomotive.
Maple Ridge......	June 30...	400	1,000	12	Unknown.
Minnie...........	July 17...	1,100	150	22	Unknown.
Moose Lake.......	Oct. 7....	1,800	......	19	Unknown.
Myhre............	June 26...	800	5,000	12	R. R. engine.
Myhre............	July 19...	1,400	20,000	10	Unknown.
Myhre............	Oct. 4....	20,000	......	7	Unknown.
Nebish...........	April 13..	1,000	none	13	Unknown.
Northern.........	May 14...	160	200	7	From adjoining town.
Northern.........	June 21...	400	none	7	Burning meadow.
Northern.........	June 26...	2000	none	9	Unknown.
Northern.........	Aug. 30...	300	100	6	R. R. locomotive.
Port Hope........	May 7....	650	4,500	35	Burning brush.
Port Hope........	May 9....	100	......	30	R. R. locomotive.
Port Hope........	June 29...	200	100	15	Unknown.
Port Hope........	Aug. 16...	400	1,500	16	Unknown.
Port Hope........	Oct. 7....	3,200	1,000	10	Unknown.
Quiring..........	Aug. 17...	80	300	6	Unknown.
Quiring..........	Aug. 19...	300	300	10	Burning brush.
Quiring..........	Oct. 9....	1,000	5,000	10	....
Spooner..........	June 29...	40	......	9	Unknown.
Spooner..........	June 28...	640	12,000	19	R. R. locomotive.
Spooner..........	July 20...	20	100	25	Unknown.
Spooner..........	Oct. 4....	......	......	......	Unknown.
Spruce Grove.....	July 18...	3,000	300	23	Burning slashings.
Spruce Grove.....	Aug. 15...	600	......	12	From adjoining town.
Summit...........	May 9....	1,000	5,000	10	Sparks from engine.
Taylor...........	May 9....	1,500	400	9	Unknown.
Taylor...........	May 10...	2,500	2,000	8	Unknown.
Turtle Lake......	June 27...	200	......	8	Clearing land.
Turtle River......	May 9....	400	none	3	Unknown.
Turtle River......	June 29...	640	500	15	Unknown.
Turtle River.......	Oct. 11...	2,000	300	2	Unknown.
Wabanaca	June 21...	40	50	15	R. R. locomotive.
Wabanaca	June 30...	1	......	......	R. R. locomotive.
Wabanaca	July 4....	640	1,000	51	R. R. locomotive.
Wabanaca	July 8....	1	......	23	R. R. locomotive.
Wabanaca	July 18...	160	none	28	R. R. locomotive.
Wabanaca	July 26...	2	......	......	R. R. locomotive.
Wabanaca	Oct. 4....	10,000	......	50	R. R. locomotive.
T. 160-33.........	Aug. 18...	20	60	13	Lightning.
Walhalla.........	May 27...	40	......	5	Clearing land.
Walhalla.........	June 29...	1	......	16	Unknown.
Walhalla.........	July 18...	100	150	51	R. R. locomotive.
Benton County—					
Alberta..........	Aug. 25...	300	500	8	Unknown.
Gilmanton........	Aug. 25...	70	350	12	Unknown.
Glendorado.......	Mar. 24...	120	160	5	Unknown.
Graham..........	Sept. 21..	100	100	6	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Benton Co.—*Cont.*					
Granite Ledge	June 20	40	......	2	Unknown.
Granite Ledge	July 7	10	none	7	Unknown.
Granite Ledge	Sept. 1	100	50	16	Unknown.
Maywood	May 10	300	......	12	Unknown.
Minden	July 19	2	60	12	Unknown.
St. George	July 29	2	......	5	R. R. locomotive.
St. George	Aug. 4	2	25	6	Unknown.
Carlton County—					
Atkinson	May 2	5,000	900	12	R. R. locomotive.
Atkinson	May 6	60	50	10	Unknown.
Atkinson	May 6	160	40	3	Unknown.
Atkinson	May 10	200	500	......	R. R. locomotive.
Atkinson	May 11	140	225	12	R. R. locomotive.
Atkinson	June 20	40	100	16	....
Barnum	June 18	1,000	200	13	From adjoining town.
Barnum	June 30	300	1,200	......	Unknown.
Beseman	May 6	200	100	6	Unknown.
Beseman	May 14	400	200	8	Unknown.
Beseman	June 21	6,000	50,000	33	R. R. locomotive.
Beseman	June 25	2,000	3,000	4	Clearing land.
Beseman	Aug. 29	1,200	18,000	10	R. R. locomotive.
Blackhoof	May 10	160	......	17	Clearing land.
Blackhoof	May 15	120	500	18	....
Eagle	May 11	3	none	4	Campers.
Eagle	May 12	600	none	22	Unknown.
Eagle	May 14	320	700	42	From adjoining town.
Eagle	June 21	600	none	3	Unknown.
Eagle	July 8	160	1,000	10	R. R. locomotive.
Eagle	July 17	200	20	33	Clearing land.
Eagle	Aug. 29	60	10	14	Burning brush.
Eagle	Aug. 28	40	100	8	R. R. locomotive.
Holyoke	May 5	3,000	1,800	22	R. R. locomotive.
Holyoke	May 7	5,000	7,500	22	R. R. locomotive.
Holyoke	May 15	3,000	......	20	R. R. locomotive.
Kalavala	June 19	2,000	3,000	100	R. R. locomotive.
Knife Falls	May 14	500	300	24	Unknown.
Lake View	May 3	300	600	3	Fishermen.
Lake View	May 6	320	300	6	Unknown.
Lake View	May 11	150	500	10	Clearing land.
Lake View	May 11	400	2,000	3	R. R. locomotive.
Lake View	June 20	240	400	30	Unknown.
Lake View	July 3	140	400	14	Clearing land.
Mahtowa	June 12	7,000	40,000	5	R. R. locomotive.
Moose Lake	May 7	160	none	22	Unknown.
Moose Lake	May 10	200	50	5	Unknown.
Moose Lake	June 17	80	150	15	R. R. locomotive.
Moose Lake	June 29	100	100	35	Unknown.
Moose Lake	Aug. 12	30	90	5	Lightning.
Red Clover	May 3	2,000	500	6	Unknown.
Red Clover	May 7	100	165	1	Unknown.
Red Clover	May 14	900	600	8	Unknown.
Red Clover	June 21	2,000	500	10	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Carlton Co.—*Cont.*					
Red Clover........	June 12...	1,000	700	13	Clearing land.
Red Clover........	June 30...	25	50	6	Unknown.
Red Clover........	July 1....	180	412	7	Unknown.
Red Clover........	Oct. 16...	80	93	10	Unknown.
Skelton...........	May 5....	300	20	3	Unknown.
Skelton...........	May 10...	2,000	5,000	14	Unknown.
Skelton...........	May 14...	40	100	10	From adjoining town.
Split Rock........	May 10...	200	1,500	12	R. R. locomotive.
Split Rock........	June 20...	10	50	10	R. R. locomotive.
Split Rock........	Sept. 14..	15	80	11	Unknown.
Thomson..........	June 27...	4,000	2,000	150	Unknown.
Twin Lakes.......	May 17...	1,500	......	2	Burning brush.
Twin Lakes.......	May 10...	80	50	5	From adjoining town.
Twin Lakes.......	June 10...	740	10,000	38	From adjoining town.
Wrenshall.........	May 9....	1,500	800	10	Unknown.
Wrenshall.........	June 29...	30	none	22	R. R. locomotive.
Wrenshall.........	July 18...	50	......	......	R. R. locomotive.
Cass County—					
Ansel.............	July 2....	600	200	13	Unknown.
Ansel.............	July 24...	80	none	4	Unknown.
Ansel.............	Oct. 16...	100	slight	10	Unknown.
Becker...........	May 16...	200	1,000	2	Unknown.
Beulah...........	May 8....	600	2,500	8	From adjoining cou'ty
Beulah...........	Aug. 19...	80	1,500	7	Unknown.
Beulah...........	Oct. 4....	400	5,000	17	Unknown.
Byron...........	June 22...	180	40	7	Unknown.
Cass Lake.........	May 9....	160	700	14	Campers.
Cass Lake.........	May 11...	1	none	2	R. R. locomotive.
Deerfield..........	May 2....	160	none	10	Mill engine.
Home Brook......	Sept. 19..	15	30	15	Clearing land.
Island Lake......	Oct. 3....	50	100	16	Hunters.
Loon Lake.......	April 10..	80	200	5	Unknown.
McKinley.........	Aug. 16...	300	200	14	Unknown.
McKinley.........	Aug. 27...	160	50	8	Unknown.
McKinley.........	Oct. 9....	800	100	19	Unknown.
McKinley.........	Oct. 18...	400	50	30	Unknown.
Maple............	April 10..	50	50	2	Unknown.
May..............	July 2....	200	200	14	R. R. locomotive.
May..............	Aug. 8....	350	150	12	R. R. locomotive.
Meadow Brook....	April 6...	500	none	7	Unknown.
Meadow Brook....	April 7...	100	20	1	Unknown.
Meadow Brook....	April 10..	1,000	125	3	Unknown.
Moose Lake.......	May 13...	1	15	6	Burning brush.
Moose Lake.......	May 14...	300	500	22	Unknown.
Moose Lake.......	May 15...	25	50	10	Burning meadow.
Pine River.......	April 13..	4,000	2,500	8	Unknown.
Pine River.......	May 9....	640	300	22	R. R. locomotive.
Pine River.......	Aug. 26...	80	50	12	Unknown.
Poplar...........	Aug. 9....	1 000	1,250	74	Hunters.
Powers...........	May 9....	550	300	18	Unknown.
Powers...........	May 22...	300	......	9	R. R. locomotive.
Smoky Hollow....	April 10..	800	2,000	1	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Cass County—*Cont.*					
Smoky Hollow	April 13	100	1,000	5	Unknown.
Walden	May 30	160	none	7	Burning meadow.
Walden	Aug. 26	75	80	25	Unknown.
Walden	Sept. 31	40	none	22	Burning brush.
Walden	Oct. 15	120	60	20	Unknown.
Walker	Oct. 16	500	......	75	Unknown.
T. 134-30	Mar. 23	1,550	......	......	Burning fire break.
T. 134-30	April 9	1,600	300	3	Unknown.
T. 143-31	April 13	500	100	14	Clearing land.
T. 145-31	Aug. 26	800	900	14	Clearing land.
Chisago County—					
Branch	June 18	80	......	......	Unknown.
Branch	July 7	640	......	11	Burning meadow.
Branch	Sept. 20	30	......	3	R. R. locomotive.
Lent	Aug. 26	100	400	20	Unknown.
Clearwater County—					
Bear Creek	May 14	160	none	11	Unknown.
Bear Creek	Oct. 6	1,000	100	10	Unknown.
Copley	Aug. 25	5	25	6	Unknown.
Copley	Sept. 30	10	10	3	R. R. locomotive.
Copley	Oct. 7	5,000	5,000	50	Unknown.
Dudley	Aug. 18	90	......	3	Burning brush.
Dudley	Oct. 9	20	40	5	Burning meadow.
Eddy	May 13	1,000	2,000	5	Unknown.
Greenwood	Aug. 20	200	none	8	From smudge.
Greenwood	Aug. 26	3	none	4	Unknown.
Greenwood	Oct. 3	1,700	10,000	22	From adjoining town
Holst	June —	680	1,000	27	Burning brush.
Holst	Aug. 26	5	none	6	Unknown.
Holst	Sept. 20	40	none	4	Unknown.
Holst	Sept. 28	80	150	7	Unknown.
Holst	Oct. 9	100	30	8	Unknown.
Holst	Oct. 9	160	200	13	Unknown.
Holst	Oct. 12	1,500	......	50	Burning fire break.
Itasca	April 11	1,920	480	5	Burning slashings.
Itasca	May 7	600	300	10	Burning slashings.
Itasca	July 15	75	......	16	Burning brush.
Itasca	July 15	160	640	34	Burning brush.
Leon	Oct. 7	1,500	40	75	Clearing land.
Minerva	July 3	60	50	12	Unknown.
Moose Creek	July 22	60	20	12	Unknown.
Moose Creek	July 30	10	10	6	Unknown.
Moose Creek	Oct. 12	2,500	1,000	13	Burning meadow.
Moose Creek	Oct. 16	250	none	9	Back-firing.
Nora	Oct. 7	20,000	400	35	Clearing land.
Nora	Oct. 21	640	500	32	Unknown.
Pine Lake	Oct. 6	4,000	2,500	150	Burning brush.
Popple	Oct. 8	80	none	......	Unknown.
Popple	Oct. 11	3,000	none	18	Unknown.
Rice	Oct. 11	800	500	28	Unknown.
Shevlin	Aug. 20	20	slight	8	Campers.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Clearwater Co.—*Cont.*					
Shevlin	Aug. 21	5	none	8	Unknown.
Shevlin	Aug. 26	4	none	13	Unknown.
Shevlin	Aug. 26	40	50	27	Unknown.
Shevlin	Oct. 7	30	150	20	R. R. locomotive.
Shevlin	Oct. 8	500	slight	13	Unknown.
Sinclair	Oct. 7	640	200	11	R. R. locomotive.
Sinclair	Oct. 7	1,200	400	20	R. R. locomotive.
T. 143-36 and 37	May 9	10,000	1,000	5	R. R. locomotive.
T. 143-36	Aug. 12	4	50	3	Campers.
T. 143-36	Aug. 25	1,400	2,900	18	Campers.
T. 144-36	Aug. 26	10	none	3	Old fire in stumps.
Cook County—					
Colville	May 9	200	200	15	Clearing land.
Colville	June 12	20,000	10,000	100	Fishermen.
Colville	July 10	1,200	none	......	From previous fire.
Grand Marais	May 10	2,300	25,000	37	Unknown.
Grand Marais	June 13	4,000	5,000	29	Camp fire.
Lutsen	May 12	100	none	15	From adjoining town
Maple Hill	April 13	3	25	10	Unknown.
Maple Hill	June 15	15,000	150000	70	Fishing party.
Rosebush	May 6	80	none	16	Burning brush.
Rosebush	May 10	14,000	100000	20	Burning brush.
Rosebush	June 15	......	20,000	25	Fishermen.
Schroeder	May 9	5,000	1,000	30	Burning brush.
Schroeder	June 19	20	none	18	Back-firing.
Schroeder	July 2	40	50	10	Unknown.
Schroeder	July 20	2,000	500	7	Unknown.
Tofte	May 9	500	20,000	50	Clearing land.
T. 65-4	June 28	10,000	30,000	none	From Canada.
T. 66-4	July 5	10,000	12,000	none	From Canada.
T. 65-4	Aug. 14	800	12,000	none	From Canada.
Crow Wing County—					
Allen	May 9	2,000	10,000	13	Campers.
Allen	Aug. 27	200	400	8	Unknown.
Baxter	Mar. 23	600	300	6	Unknown.
Daggett Brook	May 11	4,000	6,000	21	Unknown.
Daggett Brook	Nov. 1	200	2,000	3	Unknown.
Dean Lake	Aug. 27	1,000	1,000	15	From Aitkin County.
Emily	April 14	600	100	7	Burning meadow.
Fairfield	April 1	640	300	6	Clearing land.
Fairfield	May 4	1,800	......	4	Burning brush.
Fairfield	May 14	600	slight	7	Campers.
Fairfield	Oct. 6	1,500	slight	14	Burning brush.
Fairfield	Oct. 9	2,000	......	23	Burning brush.
Fairfield	Oct. 13	300	100	2	Hunters.
Fort Ripley	Mar. 20	500	100	12	R. R. locomotive.
Fort Ripley	Mar. 22	100	none	5	From adjoining town.
Garrison	July 29	80	none	10	Unknown.
Jenkins	June 30	30	......	7	R. R. locomotive.
Klondike	April 10	5	30	......	R. R. locomotive.
Klondike	April 13	8	200	5	R. R. locomotive.

SUMMARY OF FOREST FIRES, 1910—Continued.

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
Crow Wing Co.—*Cont.*					
Klondike.........	May 13...	300	1,000	......	R. R. locomotive.
Lake Edwards....	April 3...	400	1,000	6	Unknown.
Little Pine.......	May 8....	640	300	......	Unknown.
Little Pine.......	May 13...	4,500	5,000	17	Unknown.
Little Pine.......	May 10...	1,200	200	6	Burning brush.
Little Pine.......	Aug. 2....	120	200	5	Burning brush.
Maple Grove......	July 21...	160	400	16	Camp fire.
Nakny Lake......	June 24...	150	50	10	Unknown.
Pelican...........	April 2...	500	500	19	Unknown.
Rabbit Lake......	Aug. 29...	200	......	6	Unknown.
Rabbit Lake......	Oct. 8....	3,000	300	3	Unknown.
Rabbit Lake......	Oct. 15...	3,000	1,750	25	Unknown.
Sibley............	May 6....	180	150	8	Unknown.
Sibley............	May 9....	120	75	9	Unknown.
Hubbard County—					
Akeley...........	May 10...	120	none	5	Unknown.
Akeley...........	June 30...	80	......	10	Unknown.
Akeley...........	Oct. 9....	2,000	300	32	Unknown.
Arago............	April 13..	10	......	5	Unknown.
Arago............	May 1....	30	......	1	Campers.
Badoura.........	July 23...	640	400	12	Unknown.
Badoura.........	July 22...	2,000	300	30	Unknown.
Clay.............	Oct. 16...	2,000	300	8	Unknown.
Clover...........	May 10...	400	200	6	Unknown.
Clover...........	June 30...	400	500	9	Unknown.
Clover...........	July 1....	80	200	9	Unknown.
Clover...........	Oct. 1....	4	......	3	Unknown.
Clover...........	Oct. 15...	1,000	150	6	Unknown.
Farden...........	May 4....	250	600	16	Unknown.
Farden...........	Sept. 21..	200	500	10	Burning brush.
Fern.............	Oct. 15...	300	50	18	Unknown.
Fern.............	Oct. 17...	2,000	1,350	30	From adjoining town.
Guthrie..........	Aug. 18...	500	100	20	Sparks from stovepipe
Hart Lake........	Aug. 18...	2,000	500	24	Burning brush.
Helga............	May 9....	1,500	500	25	Unknown.
Hendrickson......	Aug. 16...	7	none	3	Unknown.
Hendrickson......	Aug. 17...	20	......	6	Unknown.
Hendrickson......	Aug. 24...	500	200	4	R. R. locomotive.
Hendrickson......	Aug. 30...	200	1,800	12	R. R. locomotive.
Hendrickson......	Oct. 8....	6,400	25,000	30	Logging locomotive.
Hendrickson......	Oct. 15...	300	70	10	From old fire.
Lake Alice........	Aug. 27...	100	100	7	Burning brush.
Lake George......	June 30...	2,800	6,000	5	Unknown.
Lake George......	July 22...	200	200	6	Unknown.
Lake Hattie......	April 11..	200	200	10	Burning slashings.
Lake Hattie......	May 4....	640	none	......	Burning brush.
Lake Hattie......	Aug. 30...	1,200	1,100	40	Unknown.
Lake Hattie......	Oct. 17...	600	10,000	3	Unknown.
Lakeport.........	July 2....	200	250	12	Unknown.
Mantrap.........	April 10..	80	25	5	Burning meadow.
Nevis............	June 28...	1,360	2,000	50	Unknown.
Schoolcraft.......	May 10...	1,500	300	9	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Hubbard Co.—*Cont.*					
Straight River	April 2	160	100	21	Fishermen.
Straight River	April 17	80	50	6	Clearing land.
Straight River	April 26	200	100	2	Unknown.
Thorp	April 29	300	25,000	40	R. R. locomotive.
Thorp	May 9	480	100	3	Burning slashings.
White Oak	May 13	480	200	30	Burning brush.
White Oak	June 29	500	500	19	Unknown.
White Oak	June 30	200	200	26	From adjoining town.
Isanti County—					
Cambridge	May 5	2	50	......	R. R. locomotive.
Dalbo	June 21	600	100	9	Unknown.
Dalbo	July 18	2,000	300	60	Burning brush.
Stanchfield	June —	1	40	2	R. R. locomotive.
Stanchfield	July 4	4	......	32	Unknown.
Stanchfield	Oct. 9	3	......	2	R. R. locomotive.
Itasca County—					
Alvwood	May 12	600	none	2	Unknown.
Bass Lake	May 10	300	25	8	Unknown.
Bearville	May 2	1,000	......	3	Unknown.
Bigfork	June 30	160	slight	none	Dynamite.
Deer River	May 9	15	50	3	Unknown.
Deer River	July —	2	200	100	Campers.
Feeley	Oct. 16	40	100	6	Unknown.
French	Aug. 18	640	5,000	12	Unknown.
Good Hope	Oct. 12	......	......	8	Unknown.
Grattan	June 24	700	2,000	5	Unknown.
Lake Jessie	May 15	200	300	13	Unknown.
Lake Jessie	June 18	10,000	5,000	25	Unknown.
Lake Jessie	Aug. 26	85	150	8	From old fire.
Nore	June 28	2	5,000	14	Incendiary.
Nore	Aug. 22	45	200	10	Unknown.
Popple	April 2	60	18	1	Unknown.
Popple	June 30	300	......	4	Unknown.
Popple	July 3	4	......	4	From adjoining town.
Sand Lake	June 26	200	100	6	Unknown.
Sand Lake	Aug. 17	2,000	250	6	Unknown.
Trout Lake	Aug. 25	2,600	200	30	Burning brush.
Wirt	June 30	2,000	200	......	R. R. locomotive.
Wirt	Sept. 10	50	60	2	R. R. locomotive.
T. 61-25	May 10	2,000	500	2	Unknown.
T. 61-25	June 29	240	slight	......	Old burning.
T. 145-25	May 8	100	25	20	Unknown.
T. 146-25	May 15	2,500	1,200	16	Unknown.
T. 147-26	July 23	......	none	3	Unknown.
Kanabec County—					
Ann Lake	July 27	3,600	3,000	21	Burning hornet's nest
Brunswick	Sept. 29	2,280	1,525	150	Burning brush.
Brunswick	June 24	......	......	2	Unknown.
Brunswick	July 8	1	......	8	Unknown.
Comfort	July 6	10	150	8	R. R. locomotive.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Kanabec Co.—*Cont.*					
Comfort	July 8	4	......	15	Unknown.
Comfort	Aug. 10	40	200	8	R. R. locomotive.
Comfort	Sept. 1	20	200	19	R. R. locomotive.
Grass Lake	June —	40	20	6	Unknown.
Kanabec	Oct. 7	60	......	20	R. R. locomotive.
Kroschel	July 31	1,000	500	17	Unknown.
Kroschel	Aug. 5	500	500	28	Unknown.
Kroschel	Sept. 18	20	slight	9	Unknown.
Kroschel	Sept. 20	4,000	2,000	20	Lightning.
Kroschel	Oct. 8	500	500	5	Unknown.
Kroschel	Oct. 13	200	500	15	From adjoining town
Peace	May 8	120	......	4	Unknown.
Peace	July 29	125	50	7	Unknown.
Peace	Aug. 9	160	200	14	Unknown.
Peace	Oct. 9	640	100	19	Hunters.
Peace	Oct. 16	3,840	5,000	20	From adjoining town.
Pomroy	May 5	3,000	2,000	11	Clearing land.
Pomroy	July 6	200	none	8	Unknown.
Pomroy	July 7	200	75	12	Clearing land.
Pomroy	Sept. 20	10	none	7	Unknown.
Pomroy	Aug. 5	5,000	700	18	From adjoining town.
Pomroy	Aug. 28	4	slight	17	Clearing land.
Pomroy	Oct. 16	400	100	18	Unknown.
South Fork	June 18	200	250	19	Unknown.
South Fork	July 25	400	300	35	Unknown.
Whited	July 16	30	327	100	R. R. locomotive.
Whited	Aug. 8	1,000	30	10	Unknown.
Koochiching Co.—					
Bannock	July 22	700	4,300	20	Unknown.
Bannock	Aug. 6	1	slight	8	Unknown.
Bear River	May 28	200	100	......	R. R. locomotive.
Bear River	June 28	400	1,000	......	R. R. locomotive.
Bear River	June 28	20	50	2	Burning slashings.
Bear River	July 29	100	50	......	R. R. locomotive.
Bear River	Sept. 9	80	100	3	Old fire.
Bear River	Sept. 21	40	......	......	Old fire.
Big Falls	June 30	700	200	60	R. R. locomotive.
Big Falls	July 16	6,000	1,000	3	Unknown.
Cingmars	June 25	320	3,000	7	Unknown.
Cingmars	June 25	10	......	......	Unknown.
Dinner Creek	Sept. 4	12	300	......	Unknown.
Englewood	May 12	200	100	10	Unknown.
Englewood	July 1	1,000	30,000	30	From village building
Englewood	Aug. 9	500	......	9	Unknown.
Eland	May 9	320	none	2	Unknown.
Evergreen	May 7	80	none	......	Unknown.
Evergreen	June 29	100	100	......	Unknown.
Evergreen	July 2	160	......	3	Clearing land.
Evergreen	July 2	1,200	4,000	4	Clearing land.
Evergreen	Sept. 1	60	100	6	R. R. locomotive.
Forest Grove	July 1	700	600	14	Village building.
Forest Grove	July 1	40	50	9	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Koochiching Co.—*Cont.*					
Forest Grove.....	Aug. 17...	200	500	13	Unknown.
Forest Grove.....	Sept. 19..	40	none	8	Burning brush.
Grand Falls.......	May 5....	50	500	8	R. R. locomotive.
Henry...........	June 20...	160	......	7	R. R. locomotive.
Henry...........	June 24...	500	......	15	Unknown.
Koochiching......	Aug. 24...	40	50	6	Campers.
Koochiching......	Sept. 26..	500	3,000	40	Clearing land.
Koochiching......	Oct. 6....	320	3,000	40	Unknown.
Lindford.........	July 5....	160	600	8	Unknown.
Manitou..........	June 28...	2,000	10,000	50	Unknown.
Meding...........	June 27...	1,000	......	......	R. R. locomotive.
Plum Creek.......	July 2....	5,000	25,000	13	Burning brush.
Rat Root.........	June 29...	100	......	2	Unknown.
Ray.............	June 29...	400	2,000	......	Unknown.
Sault............	July 6....	690	1,000	35	Unknown.
Watrous.........	Oct. —...	2,000	3,000	......	Unknown.
Sturgeon River....	Oct. 9....	640	......	......	Clearing land.
Wildwood........	June 30...	1,200	2,000	8	Clearing land.
Wildwood........	July 4....	30	100	7	Unknown.
T. 67-25.........	June 1....	5,000	4,000	10	Unknown.
T. 68-25.........	June 9....	2,000	1,000	8	Unknown.
T. 68-26.........	June 30...	100	1,500	7	Unknown.
T. 69-25.........	June 28...	3,000	4,000	6	R. R. locomotive.
T. 69-25.........	July 13...	5,000	2,000	7	R. R. locomotive.
T. 152-25........	July 1....	300	......	12	Unknown.
T. 152-25........	July 3....	640	......	27	Burning brush.
T. 152-25........	July 17...	400	......	12	Burning brush.
T. 159-28........	May 9....	7	50	4	Unknown.
T. 160-24........	June 28...	4,000	6,000	15	Burning brush.
T. 160-28........	Aug. 25...	400	1,000	10	Clearing land.
Lake County—					
Beaver Bay.......	May 9....	20,000	5,000	35	Unknown.
Crystal Bay......	May 10...	210	2,300	3	Burning slashings.
Crystal Bay......	May 8....	8,000	6,000	12	Unknown.
Crystal Bay......	May 8....	10,000	30,000	12	Unknown.
Crystal Bay......	June 10...	3,000	5,000	10	Unknown.
Crystal Bay......	June 12...	1,800	4,000	12	Campers.
Silver Creek......	May 8....	32,000	64,000	44	From adjoining town
Two Harbors.....	May 8....	6,000	200	4	Unknown.
Two Harbors.....	June 8....	100	......	12	R. R. locomotive.
Waldo...........	May 9....	3,000	1,000	3	Unknown.
Waldo...........	May 11...	6,000	3,000	6	Unknown.
Waldo...........	June 7....	230	50	7	R. R. locomotive.
Marshall County—					
Central..........	Oct. 2....	3,840	800	9	Unknown.
Como............	July 3....	3,000	500	4	Unknown.
Como............	Aug. 7....	......	......	3	Unknown.
Como............	Sept. 21..	80	50	5	Unknown.
Como............	Oct. 7....	500	500	14	Unknown.
Espelie..........	Aug. 12...	200	......	11	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Marshall Co.—*Cont.*					
Moose River	July 18	500	200	3	Unknown.
Moose River	July 20	4,000	1,000	81	From adjoining town
Thief Lake	Aug. 14	1,600	5,000	21	Unknown.
Veldt	Oct. 7	5,000	2,000	6	Unknown.
Veldt	Oct. 7	5	200	8	Unknown.
West Valley	Oct. 9	3,000	500	16	Unknown.
Whiteford	July 29	260	500	34	Unknown.
Whiteford	Sept. 19	6,000	1,500	23	Unknown.
Wright	Oct. 9	1,800	300	3	Unknown.
Mille Lacs County—					
Bogus Brook	July 18	1,300	......	107	From adjoining town.
East Side	Aug. 27	200	50	26	Unknown.
Isle Harbor	April 2	100	......	30	Clearing land.
Isle Harbor	June 16	200	300	20	Clearing land.
Kathio	Mar. 24	200	150	1	Hunters.
Kathio	Oct. 8	1,200	3,200	10	Unknown.
Kathio	Oct. 8	300	1,000	20	Unknown.
Kathio	Oct. 16	2	none	15	Unknown.
Kathio	Oct. 17	100	......	8	Unknown.
Milaca	Sept. 24	80	25	15	Hunters.
Milaca	Oct. 16	1	......	11	Unknown.
Milaca	Oct. 17	600	......	50	Unknown.
Milaca	Oct. 18	200	......	14	R. R. locomotive.
Milo	June 30	12	10	2	Unknown.
Milo	Aug. 16	20	50	7	R. R. locomotive.
Milo	Sept. 13	200	......	......	R. R. locomotive.
Milo	Oct. 8	6	100	17	Burning brush.
Onamia	April 7	40	none	10	Unknown.
Onamia	April 10	2,400	......	55	Unknown.
Onamia	Aug. 12	450	1,000	30	R. R. locomotive.
Onamia	Sept. 19	3,500	1,500	4	R. R. locomotive.
Page	July 17	100	200	14	Threshing engine.
Page	July 19	100	none	30	Portable engine.
Page	Oct. 3	400	150	10	Clearing land.
T. 40-26	June 18	3,840	500	29	Unknown.
Morrison County—					
Culdrum	July 27	4	none	2	Unknown.
Culdrum	Sept. 30	30	none	1	Unknown.
Cushing	Aug. 11	50	40	8	Unknown.
Cushing	Aug. 28	3	none	7	R. R. locomotive.
Darling	May 13	80	10	10	Unknown.
Darling	July 19	5	5	11	R. R. locomotive.
Darling	Aug. 6	80	500	30	R. R. locomotive.
Elm Dale	Sept. 10	10	none	19	Unknown.
Elm Dale	Sept. 20	200	100	......	Unknown.
Elm Dale	Sept. 30	30	......	......	Unknown.
Granite	June 22	800	300	3	Unknown.
Granite	June 24	200	600	11	Unknown.
Hillman	Aug. 20	2,000	500	4	Unknown.
Hillman	Sept. 1	6,000	10,000	35	Unknown.
Lakin	Oct. 7	10,000	8,000	31	From adjoining town.

SUMMARY OF FOREST FIRES, 1910—Continued.

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
Morrison Co.—*Cont.*					
Little Falls.......	June 15...	40	50	3	Unknown.
Merrill...........	Sept. 19..	5,000	3,000	100	From adjoining town.
Merrill...........	Oct. 8....	4,000	2,000	53	Old fire.
Mt. Morris........	Oct. 9....	11,500	......	19	Hunters.
Parker...........	Mar. 19...	1,500	none	......	Unknown.
Parker...........	Mar. 19...	3,000	500	12	Unknown.
Parker...........	Mar. 23...	160	none	17	Unknown.
Parker...........	Mar. 23...	2,000	1,500	8	Unknown.
Parker...........	Aug. 26...	150	......	22	Burning brush.
Pulaski..........	Aug. 27...	4,000	2,000	49	Unknown.
Pike Creek.......	Oct. 5....	400	450	10	Hunters.
Ripley...........	Mar. 25...	1,500	1,500	14	Unknown.
Ripley...........	April 2...	1,000	600	20	Unknown.
Rosing...........	April 3...	40	slight	9	Unknown.
Scandia Valley....	Oct. 15...	8,000	1,000	18	R. R. locomotive.
T. 130-31.........	Aug. 10...	30	200	9	Unknown.
Norman County—					
Fossum..........	Oct. 10...	160	400	20	From adjoining town.
Otter Tail County—					
Blowers..........	June 21...	2	10	20	Unknown.
Blowers..........	Aug. 13...	80	25	9	From adjoining town
Bluffton..........	Aug. 14...	140	1,000	11	Burning brush.
Bluffton..........	Sept. 20..	100	800	8	Unknown.
Bluffton..........	Oct. 9....	160	300	8	Burning brush.
Bluffton..........	Oct. 18...	40	1,000	8	Unknown.
Butler...........	Sept. 9...	2,000	1,200	27	Unknown.
Candor...........	Sept. 20..	160	200	13	Unknown.
Candor...........	Oct. 10...	400	300	9	Unknown.
Deer Creek.......	Sept. 10..	80	100	36	Unknown.
Eastern..........	Oct. 7....	1,200	100	40	From adjoining town
Hobert...........	Sept. 19..	640	300	12	Unknown.
Homestead.......	Aug. 11...	1	......	9	Unknown.
Inman...........	Oct. 4....	1,500	300	25	Unknown.
Paddock.........	Aug. 11...	120	......	18	Burning brush.
Star Lake........	Sept. 18..	350	1,500	29	Unknown.
Truman..........	July 3....	100	50	12	By boys.
Pine County—					
Berry............	Aug. 6....	640	200	12	R. R. locomotive.
Bremen..........	May 8....	2,000	1,000	32	Started near road.
Bremen..........	July 17...	300	......	5	Burning brush.
Bremen..........	Sept. 22..	40	none	18	Unknown.
Brook Park.......	July 29...	2,000	4,000	30	R. R. locomotive.
Brook Park.......	Aug. 5....	300	......	20	Clearing land.
Brook Park.......	Aug. 30...	600	140	30	R. R. locomotive.
Brook Park.......	Sept. 19..	3,000	......	7	Old fire.
Bruno...........	May 6....	200	none	5	Unknown.
Bruno...........	May 8....	1,000	300	9	From adjoining town.
Bruno...........	July 7....	640	700	9	R. R. locomotive.
Bruno...........	July 15...	1,500	7,400	9	R. R. locomotive.
Bruno...........	July 26...	20	100	20	R. R. locomotive.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Pine County—*Cont.*					
Bruno	July 29	300	100	5	R. R. locomotive.
Bruno	Aug. 1	300	300	3	From old fire.
Bruno	Sept. 20	600	200	41	Clearing land.
Danforth	May 6	2,000	500	25	Unknown.
Dell Grove	July 1	2,160	1,000	......	Unknown.
Dell Grove	July 4	30	300	20	R. R. locomotive.
Dell Grove	July 20	30	75	9	R. R. locomotive.
Dell Grove	Aug. 2	160	350	20	R. R. locomotive.
Dell Grove	Aug. 7	70	......	12	R. R. locomotive.
Dell Grove	Aug. 12	50	1,780	9	R. R. locomotive.
Dell Grove	Aug. 27	20	......	16	Unknown.
Dell Grove	Sept. 18	400	100	15	Old fire.
Dell Grove	Sept. 20	40	none	8	Unknown.
Dell Grove	Oct. 8	600	300	60	Clearing land.
Dorsey	May 5	200	50	2	Unknown.
Dorsey	July 31	3,000	1,000	8	Unknown.
Dorsey	Oct. 18	1,200	800	4	Unknown.
Finlayson	July 16	320	300	46	Burning brush.
Hinckley	June 21	160	400	4	R. R. locomotive.
Hinckley	July 4	160	1,500	25	R. R. locomotive.
Hinckley	July 17	200	1,700	10	R. R. locomotive.
Hinckley	July 29	300	1,500	26	Unknown.
Hinckley	Aug. 5	3,000	......	75	From adjoining town.
Hinckley	Aug. 7	320	350	12	R. R. locomotive.
Hinckley	Aug. 29	40	300	10	R. R. locomotive.
Hinckley	Sept. 10	640	200	18	Unknown.
Kerrick	May 3	40	......	......	R. R. locomotive.
Kerrick	May 5	200	875	4	R. R. locomotive.
Kerrick	May 9	1,680	75	5	From adjoining town.
Kerrick	May 9	80	100	16	R. R. locomotive.
Kerrick	May 15	700	650	30	Unknown.
Kerrick	June 18	3,160	2,000	100	Burning brush.
Kerrick	July 13	3,000	700	42	Unknown.
Kettle River	June 18	20	100	22	Clearing land.
Kettle River	July 6	1,500	5,000	97	R. R. locomotive.
Kettle River	July 28	260	400	13	Burning brush.
Mission Creek	June 22	320	......	18	From adjoining town
Mission Creek	Aug. 12	300	450	22	R. R. locomotive.
Mission Creek	Aug. 26	640	300	36	Old fire.
Mission Creek	Sept. 18	200	75	26	Old fire.
Munch	July 29	400	700	26	Burning brush.
Nickerson	May 8	3,500	2,000	38	Unknown.
Nickerson	May 15	60	none	22	R. R. locomotive.
Nickerson	July 5	150	none	15	R. R. locomotive.
Norman	May 8	200	50	10	Burning brush.
Norman	May 14	4,000	2,000	10	Unknown.
Norman	June 23	800	1,000	9	Unknown.
Norman	July 7	600	15,000	11	R. R. locomotive.
Pine City	June 20	160	150	14	Clearing land.
Pine City	June 22	35	......	2	Unknown.
Pine City	July 6	3	75	11	Old fire.
Pine Lake	June 24	80	100	23	Clearing land.
Pine Lake	July 22	200	300	17	Burning brush.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Pine County—*Cont.*					
Pine Lake	July 29	640	100	51	Old fire.
Pine Lake	Aug. 26	320	96	16	From stove pipe.
Pine Lake	Sept. 14	4,000	......	50	Unknown.
Pine Lake	Sept. 20	640	100	45	Old fire.
Pokegama	June 18	580	500	13	Lighting pipe.
Pokegama	June 19	600	400	40	R. R. locomotive.
Pokegama	June 23	80	100	10	Unknown.
Pokegama	July 5	2,000	5,000	150	R. R. locomotive.
Pokegama	July 7	800	600	20	R. R. locomotive.
Pokegama	July 27	600	1,500	29	Lightning.
Pokegama	Aug. 12	44	400	60	R. R. locomotive.
Pokegama	Aug. 28	300	200	15	R. R. locomotive.
Pokegama	Sept. 1	200	500	......	R. R. locomotive.
Pokegama	Sept. 20	1,000	600	25	Unknown.
Pokegama	Oct. 7	700	none	9	Unknown.
Rock Creek	June 18	......	none	3	Unknown.
Rock Creek	July 19	50	......	40	R. R. locomotive.
Royalton	Sept. 4	320	......	6	R. R. locomotive.
Sandstone	June 15	75	......	15	R. R. locomotive.
Sandstone	May 13	700	100	13	Unknown.
Sandstone	July 6	800	300	29	R. R. locomotive.
Sandstone	July 8	80	......	50	R. R. locomotive.
Sandstone	July 6	1,500	500	75	Unknown.
Sandstone	July 7	200	......	50	R. R. locomotive.
Sandstone	Aug. 5	80	25	44	R. R. locomotive.
Sandstone	Aug. 6	60	......	12	R. R. locomotive.
Sturgeon Lake	May 5	1,000	3,000	20	Burning brush.
Sturgeon Lake	June 18	160	300	13	Unknown.
Sturgeon Lake	July 7	200	100	27	Unknown.
Sturgeon Lake	July 20	80	1,000	20	Unknown.
Sturgeon Lake	July 28	10	none	8	Unknown.
Wilma	April 7	2,500	500	17	Clearing land.
Wilma	July 20	15	300	18	Burning brush.
Windmere	Oct. 17	1,100	1,500	31	Burning meadow.
Polk County—					
Knute	Aug. 13	10	140	16	Clearing land.
Woodside	Oct. 11	4	50	8	Portable engine.
Red Lake County—					
Emardville	June 22	1,000	......	8	Unknown.
Plummer	Oct. 10	40	......	5	Unknown.
Riner	Aug. 11	320	......	......	Unknown.
Roseau County—					
Algoma	Oct. 7	1,100	6,500	24	Unknown.
Barnett	July 18	200	......	22	Unknown.
Barnett	July 22	400	......	8	Unknown.
Deer	July 18	800	1,600	29	From adjoining town.
Deer	Oct. 12	2	40	24	From adjoining town.
Dieter	Aug. 7	40	150	20	Unknown.
Dieter	Oct. 9	200	......	24	Unknown.
Dieter	Oct. 10	160	none	21	From Canada.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Roseau Co.—*Cont.*					
Falun	Sept. 30	550	40	19	Unknown.
Falun	Oct. 1	8,000	35	29	Unknown.
Falun	Oct. 6	1,646	......	27	Unknown.
Golden Valley	Aug. 27	6	none	3	Clearing land.
Huss	July 17	580	4,000	12	Unknown.
Huss	Aug. 29	......	......	8	Unknown.
Huss	Sept. 17	3,000	......	35	Unknown.
Huss	Oct. 7	6,000	700	13	Unknown.
Leaona	June —	1,500	7,500	......	Unknown.
Michenoch	July 22	160	1,000	10	Unknown.
Moranville	Sept. 20	......	......	......	R. R. locomotive.
Neresen	July 12	5,460	2,000	13	Unknown.
Neresen	Aug. 19	500	......	5	Unknown.
Oaks	April 25	200	300	50	Unknown.
Oaks	July 13	1,200	4,000	25	Burning brush.
Oaks	Sept. 14	180	none	1	Hunters.
Oaks	Sept. 28	1,280	......	11	Unknown.
Poplar Grove	July 5	200	none	1	Unknown.
Poplar Grove	Aug. 19	5,000	12,000	10	Unknown.
Poplar Grove	Aug. 21	700	1,000	4	Unknown.
Spruce	July 19	80	none	16	Intentional.
Spruce	Oct. 7	2,000	300	25	Unknown.
T. 163-38	July 10	85	800	15	Unknown.
St. Louis County—					
Alborn	July 1	4	none	12	R. R. locomotive.
Alborn	July 4	60	10	2	R. R. locomotive.
Alborn	Aug. 26	300	none	4	R. R. locomotive.
Angora	June 16	120	600	21	Unknown.
Buyck	June 22	5	50	5	Unknown.
Buyck	June 25	2	......	6	Old fire.
Buyck	July 4	3	1,000	13	Unknown.
Canosia	June 20	80	......	12	Unknown.
Canosia	June 28	7	50	15	Unknown.
Canosia	Oct. 9	40	60	......	R. R. locomotive.
Cedar Valley	May 13	480	3,000	15	Unknown.
Cedar Valley	Aug. 19	1,000	112	18	Clearing land.
Colten	June 23	1,000	500	10	Unknown.
Culver	April 20	100	100	4	Unknown.
Culver	May 7	40	50	13	R. R. locomotive.
Culver	May 10	40	275	7	R. R. locomotive.
Culver	July 21	600	200	14	R. R. locomotive.
Duluth	May 5	50,000	70,000	26	Burning slashings.
Embarrass	June 17	7,680	25,000	70	From adjoining town.
Embarrass	June 18	1,000	5,000	32	Unknown.
Embarrass	July 4	1,000	3,000	25	From adjoining town.
Fern	June 23	160	35,000	......	Burning slashings.
Floodwood	May 8	1,300	3,000	40	Unknown.
French	June 28	200	2,000	25	Unknown.
Gnesen	July 19	300	1,000	9	Unknown.
Grand Lake	April 13	200	none	......	R. R. locomotive.
Grand Lake	May 13	500	100	17	From adjoining town.
Grand Lake	June 10	50	200	4	R. R. locomotive.

SUMMARY OF FOREST FIRES, 1910—Continued.

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters	Cause
St. Louis Co.—*Cont.*					
Grand Lake	July 5	1,500	10,000	31	Burning brush.
Great Scott	May 10	640	......	......	Unknown.
Independence	May 15	3,000	5,000	16	Unknown.
Industrial	April 23	8,000	15,000	22	Unknown.
Industrial	May 9	550	10,000	15	R. R. locomotive.
Industrial	June 15	20	150	6	R. R. locomotive.
Industrial	June 27	100	500	8	R. R. locomotive.
Kelsey	June 17	240	500	8	R. R. locomotive.
Kelsey	June 30	1,000	500	9	R. R. locomotive.
Kelsey	Aug. 26	600	100	12	From adjoining town
Kugler	April 10	480	1,000	4	Clearing land.
Kugler	June 16	4	100	7	R. R. locomotive.
Kugler	June 21	600	3,000	24	R. R. locomotive.
Kugler	June 28	2	......	4	R. R. locomotive.
Kugler	July 1	400	1,500	10	R. R. locomotive.
Kugler	July 5	640	1,000	30	Cigarette.
Lavell	May 6	400	slight	6	R. R. locomotive.
Lavell	June 25	4,000	8,000	14	Unknown.
Lavell	July 1	4,000	3,300	5	Unknown.
McDavitt	June 20	2,000	1,000	15	Unknown.
McDavitt	June 20	500	1,000	5	R. R. locomotive.
McDavitt	June 29	1,000	245	10	R. R. locomotive.
Meadowlands	May 7	160	50	2	Unknown.
Meadowlands	May 12	20	none	......	R. R. locomotive.
Meadowlands	June 17	640	100	20	Clearing land.
Meadowlands	June 17	40	slight	8	R. R. locomotive.
Meadowlands	June 21	20	200	5	Cigar.
Meadowlands	June 22	1,200	250	27	Clearing land.
Meadowlands	Aug. 19	320	......	12	Burning brush.
Meadowlands	Aug. 20	2,000	400	14	Unknown.
Midway	July 2	4	slight	11	Lightning.
Morse	May 10	10	......	8	Clearing land.
Morse	June 29	4,500	2,000	23	R. R. locomotive.
Morse	June 30	1,200	25,000	30	Unknown.
New Independence	May 4	700	150	9	Unknown.
Normana	May 9	2,000	8,000	40	R. R. locomotive.
Northland	June 21	40	100	2	Unknown.
Pike	May 11	20	50	4	Unknown.
Prairie Lake	May 13	85	200	10	Unknown.
Prairie Lake	July 1	200	200	6	R. R. locomotive.
Solway	May 13	5,000	......	......	Unknown.
Solway	May 15	80	100	5	Unknown.
Solway	May 15	400	700	13	Unknown.
Solway	June 9	160	300	12	Unknown.
Solway	June 27	106	1,000	20	Clearing land.
Solway	July 4	166	5,000	14	Unknown.
Sturgeon	June 14	10	300	6	Unknown.
Van Buren	May 10	700	350	12	Unknown.
Wourri	June 30	50	......	13	R. R. locomotive.
Wourri	July 3	120	500	15	R. R. locomotive.
T. 50-20	May 8	1,300	3,000	6	Unknown.
T. 51-19	Mar. 26	30	none	4	R. R. locomotive.
T. 51-19	April 13	40	none	6	Unknown.

SUMMARY OF FOREST FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
St. Louis Co.—*Cont.*					
T. 53-16	June 15	2,000	15,000	13	Campers.
T. 55-19	June 27	1,500	......	17	R. R. locomotive.
T. 59-21	June 3	160	250	20	Campers.
T. 69-21	July 20	800	1,000	3	Unknown.
Todd County—					
Fawn Lake	July 2	60	50	9	From adjoining town
Little Sauk	April 25	60	......	4	Clearing land.
Little Sauk	July 20	2	......	......	Clearing land.
Villard	May 17	80	1,000	......	R. R. locomotive.
Wadena County—					
Blueberry	Sept. 14	40	none	11	Unknown.
Bullard	April 11	700	28	4	Unknown.
Bullard	May 13	150	200	3	Unknown.
Bullard	Aug. 5	320	300	8	Unknown.
Huntersville	Oct. 16	320	1,000	34	Unknown.
Leaf River	July 4	2	30	6	Unknown.
Leaf River	Aug. 12	320	100	20	Burning brush.
Leaf River	Aug. 17	10	none	7	Clearing land.
Lyons	April 27	80	none	4	Unknown.
Lyons	May 7	50	10	4	Unknown.
Lyons	May 11	800	500	19	Unknown.
Lyons	Aug. 30	30	none	16	From adjoining town.
Lyons	Sept. 20	10	12	11	Unknown.
Lyons	Sept. 29	6,000	10,000	108	Unknown.
Lyons	Oct. 16	80	none	9	Unknown.
Meadow	June 19	400	300	20	Unknown.
Meadow	Oct. 9	6	100	50	Old fire.
North Germany	Aug. 29	60	125	17	From adjoining town.
North Germany	Oct. 11	50	100	25	Unknown.
Orton	Oct. 19	800	500	56	Unknown.
Rockwood	April 10	240	none	15	Unknown.
Rockwood	June 24	8	35	5	Unknown.
Rockwood	June 29	15	50	16	Unknown.
Rockwood	July 7	40	40	9	Unknown.
Rockwood	Aug. 12	40	none	17	Unknown.
Rockwood	Aug. 20	4	25	15	Unknown.
Rockwood	Sept. 11	6	none	10	Hunters.
Wing River	Aug. 5	400	1,000	32	Hunters.

Total acres burned over, 1,051,333. Damage, $1,721,752. Number of fighters, 15,260.

Classification of causes:

- Burning brush, 67.
- Burning meadow, 9.
- Campers, 24.
- Clearing land, 58.
- Fishermen and hunters, 17.
- From adjoining town, 46.
- Railroad locomotives, 183.
- Other causes, 55.
- Unknown, 477.

SUMMARY OF PRAIRIE FIRES, 1910

COUNTY AND TOWN	Date	Acres	Damage	No. Fire Fighters.	Cause
Anoka County—					
Ham Lake........	March —.	200	2,000	6	Unknown.
Oak Grove.......	Aug. 28...	80	500	50	Hunters.
Becker County—					
Walworth........	April 5...	1,000	40	none	Clearing land.
Benton County—					
Langola..........	April 10..	250	3,000	6	Unknown.
Clay County—					
Barnesville.......	May 2....	600	60	1	R. R. locomotive.
Cromwell.........	Aug. 29...	25	50	5	R. R. locomotive.
Elkton...........	Mar. 22...	80	6	......	Unknown.
Elkton...........	May 13...	60	20	1	Unknown.
Elkton...........	Aug. 11...	30	40	......	R. R. locomotive.
Hawley..........	Aug. 28...	10	100	8	R. R. locomotive.
Ulen.............	Oct. 4....	300	600	35	R. R. locomotive.
Ulen.............	Oct. 12...	70	200	25	R. R. locomotive.
Viding...........	Oct. 6....	720	820	26	R. R. locomotive.
Chisago County—					
Lent.............	Sept. 18..	50	3,000	8	R. R. locomotive.
Kittson County—					
Arveson..........	July 19...	480	150	15	Clearing land.
Deerwood........	Sept. 30..	40	none	2	R. R. locomotive.
Pelan............	Oct. 1....	300	......	......	Unknown.
Percy............	Oct. 10...	100	100	6	Unknown.
St. Joseph........	Oct. 28...	400	......	2	Unknown.
Lac qui Parle Co.—					
Augusta..........	Sept. 10..	20	60	8	R. R. locomotive.
Mahnomen County—					
Beaulieu.........	Oct. 3....	600	70	4	Unknown.
Marshall County—					
Cedar............	Aug. 9....	500	100	6	Unknown.
East Valley.......	Sept. 28..	1,200	125	10	Unknown.
East Valley.......	Oct. 5....	3,000	1,700	24	Unknown.
Espelie..........	Aug. 12...	5,000	500	15	From adjoining town.
Espelie..........	Oct. 3....	12,000	2,000	30	Unknown.
Espelie..........	Oct. 15...	4,000	12,000	12	Old fire.
Grand Plain......	Aug. 13...	1,600	300	18	From adjoining town.
Huntley..........	July 20...	300	1,000	12	R. R. locomotive.
Huntley..........	July 23...	2,000	3,000	14	Unknown.
Huntley..........	Aug. 1....	2,000	3,000	11	Unknown.
Huntley..........	Aug. 26...	2,000	5,000	6	Burning brush.
Lincoln..........	July 19...	400	150	16	Burning hay.
Linsell...........	July 7....	80	none	23	Burning brush.

SUMMARY OF PRAIRIE FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Marshall Co.—*Cont.*					
Moose River	April 10	640	none	4	Unknown.
Moose River	July 8	120	300	14	Unknown.
Moose River	Oct. 3	1,200	400	20	From adjoining town
Spruce Valley	July 18	2	......	4	Unknown.
Veldt	Oct. 1	5,000	15,000	4	Unknown.
West Valley	Oct. 9	3,000	3,000	3	Unknown.
Whitford	Aug. 18	500	none	28	Unknown.
Polk County—					
Belgium	Oct. 5	2,500	1,700	38	R. R. locomotive.
Brandt	Nov. 3	3,000	150	3	From adjoining town
Chester	Sept. 30	2,000	2,000	20	Burning brush.
Chester	Oct. 7	1,500	4,000	31	R. R. locomotive.
Helgeland	Oct. 11	100	500	12	Unknown.
Kertsonville	May 13	40	......	7	Unknown.
Onatad	Oct. 7	3,000	500	30	R. R. locomotive.
Tilden	June 26	150	1,525	7	R. R. locomotive.
Red Lake County—					
Emardville	June 21	500	......	8	Unknown.
Goodridge	Aug. 14	6,000	3,000	20	From adjoining town
Hickory	Sept. 21	14,000	5,000	42	Unknown.
Kratka	Aug. 31	100	none	3	Unknown.
Mayfield	Aug. 11	200	200	10	Unknown.
Polk Center	Nov. 4	600	......	4	Unknown.
Reimer	Aug. 13	1,000	500	53	Unknown.
Smiley	Oct. 3	10	......	10	Unknown.
Starr	Aug. 13	3,000	3,000	20	Unknown.
Starr	Aug. 19	1,000	2,000	25	Burning fire-break.
Starr	Aug. 15	1,200	500	30	Unknown.
Starr	Aug. 29	2,000	500	20	Unknown.
Roseau County—					
Barnett	July 21	640	300	7	Unknown.
Barnett	Oct. 9	1,500	450	7	Unknown.
Dieter	July 18	600	50	6	Intentional.
Dieter	Aug. 11	40	26	15	Old fire.
Dieter	Oct. 7	800	800	32	Unknown.
Moose and 163-43	Oct. 8	18,000	6,000	5	Unknown.
Moranville	July 6	120	200	......	R. R. locomotive.
Nereson	Aug. 27	900	140	9	Unknown.
Pohlitz	Oct. 3	1,600	......	8	From adjoining town
Pohlitz	Oct. 7	5,000	3,000	8	R. R. locomotive.
Polonia	Oct. 7	15,000	1,000	......	Unknown.
Skagen	April 13	500	100	6	Burning brush.
Spruce	July 3	96	500	7	Burning brush.
Spruce	Sept. 22	500	none	12	Unknown.
Spruce	Oct. 5	900	500	27	Burning meadow.
Sherburne County—					
Santiago	May —	300	......	12	Unknown.

SUMMARY OF PRAIRIE FIRES, 1910—Continued.

County and Town	Date	Acres	Damage	No. Fire Fighters	Cause
Swift County—					
Six Mile Grove....	Mar. 22...	1,000	800	3	Unknown.
Wadena County—					
Wadena...........	Aug. 20...	4	25	13	Unknown.
Wing River.......	Aug. 5....	40	150	14	Unknown.
Wilkin County—					
Akron............	Oct. 5....	320	100	10	Boys.
Yellow Medicine Co.—					
Florida...........	May 13...	400	90	15	Unknown.

Total acres burned over, 140,117. Damage, $97,697. Number of fighters, 1,091.

Classification of causes:

Burning brush, 5.
Burning meadow, 2.
Clearing land, 2.
Fishermen and hunters, 1.
From adjoining town, 6.
Railroad locomotives, 17.
Other causes, 5.
Unknown, 44.

PAY FOR FIRE FIGHTERS.

As stated in my special report of January 18, herein above, the aggregate amount of unpaid accounts for fighting fire up to that date was $94,507.31. A bill to appropriate that amount was introduced early in the session of the Legislature. By April 7th the amount had increased by the receipt of additional accounts, to $106,113.91; and as this report goes to press it has become still larger. But the total amount appropriated to pay these accounts was $94,700 (chapter 265, approved April 19, 1911); which being insufficient, the accounts had to be settled by a pro rata payment.

EFFECT OF LAW AGAINST FOREST FIRES.

It has been said that the perfection of liberty is the perfection of restraint. Laws that are not unduly severe and which are impartially enforced, help to secure people in the enjoyment of their liberty and rights. It would not be just to society to allow people who are unable to make restitution to practice negligence with fire whereby their neighbors suffer. The law does not prosecute and punish a person for causing a forest fire because there is a wish to make him suffer, but to deter and warn others. When there is a prosecution, conviction and punishment of a citizen for such an offense the matter is talked about. The law becomes advertised and people are made more careful. Under such conditions and risks as we now have in the forest regions of Minnesota, it will take many years to bring about that general exercise of care in respect to the use of fire which ought to prevail; but a reasonably strict law impartially administered will hasten the time.

Actuated by the above consideration, I submitted the following bill to the Forestry Committees of the House and Senate of the last legislature, with request that substantially such a bill should be introduced by them as their bill. It, however, was not introduced.

FORESTRY COMMISSIONER'S BILL.

The following is the bill as drawn by the Forestry Commissioner and by him presented to the House Forestry Committee early in the session of the Legislature of 1911. As the Committee did not take favorable action on it, he did not press it further.

NOTE—New matter in italics.

A Bill for an Act to Provide for the preservation of forests in this state and for the prevention and suppression of forest and prairie fires, and to appropriate money therefor.

Whereas, the forests in Minnesota are estimated to be worth $100,000,000 *and their net increase in value by growth is estimated to be at the rate of two per cent per annum or* $2,000,000; *and*

Whereas, the destruction of considerable of the State's standing timber by forest fires during the past uncommonly dry summer and autumn, and the destruction in many instances of the entire property of many settlers, causing them great suffering; also the sad loss of human life by such fires, make it necessary that better safeguards be provided to prevent another such calamity. Therefore,

Be it enacted by the Legislature of the State of Minnesota:

Section 1. *Until otherwise provided by law, the Auditor, Treasurer and Attorney General shall be and are hereby constituted an Advisory Board to supervise the administration of the office of Forestry Commissioner and the expenditure of the money appropriated for the prevention and suppression of forest and prairie fires. In case of extreme emergency, when the appropriation is insufficient to pay the necessary current expense for preventing and suppressing such fires, and the Board deems it necessary for the public safety so to do, it may, with the approval of the Governor, incur such expense, not exceeding sixty thousand dollars in any one year, as is necessary for that purpose, but special report thereof shall be made by the Board to the next ensuing Legislature.*

From and after the passage of this act the title of the Forestry Commissioner shall be Forester, and any vacancy in the office shall be filled by the Governor by the appointment of a technically trained forester known for executive ability. The Governor may appoint a competent assistant forester who has graduated with honor at a forestry school. Said Board may fix the rate of compensation of the forester and of the assistant forester, which shall be paid monthly. All appointments in the forestry service shall be solely for fitness, and without regard to party adherence. The amounts necessary to pay the expense and *compensation above mentioned are hereby annually appropriated out of any money in the treasury not otherwise appropriated, and shall be available immediately.*

[NOTE—The advisory board can better obtain a first-class forester if it can fix his compensation, as was done by the regents of the University in securing a new president.]

SEC. 2. The supervisors and clerks of towns, mayors of cities and presidents of village councils, are hereby constituted fire wardens for their respective districts, and shall be held responsible that their districts are exempt from dangerous forest and prairie fires. Upon request of the *forester*, county auditors shall immediately furnish the names and addresses of the chairmen of town boards, the names of towns, and the numbers and ranges of the township in each, in their respective counties. The *forester* may appoint fire wardens for unorganized territory, and additional wardens wherever he may deem necessary; *and he may for such period as he deems proper substitute an appointed warden to serve in place of the supervisors and clerk of a town*, and he may direct any warden to perform duties at a point outside of his district. The wardens shall enforce the provisions of this chapter. They shall, *when expedient*, divide their town into districts and assign one of their number to each district. In case of absence from their districts in dry *weather*, they shall designate someone to act in their place; also notify the warden of the adjoining district. They shall take energetic precautions to prevent forest and prairie fires, visit all parts of roads, trails, camps and frequented places, warn campers or other users of fire, and extinguish small or smouldering fires. They shall patrol their districts in dry *weather*, immediately inform the *forester* when there is need of patrolling, and, with *his* approval, employ patrols to guard against carelessness in the use of fire. They shall, within ten days after receiving the same, post warning notices furnished them by the *forester*, give verbal warning, when they deem it necessary, against causing fires, and take all other suitable precautions for the prevention of fires. They shall take measures to suppress or control fire they have reason to think is being neglected in any adjoining or neighboring district or town. They shall promptly investigate each forest and prairie fire within their respective districts, follow the track of the fire to the place where it started, fix responsibility therefor, if possible, and within three days report the cause thereof, the property destroyed, its value, the lives lost, if any, the means used to combat such fire, and any additional facts required by the *forester*. They shall make such other reports as he may require, and promptly comply with his instructions. Each warden shall co-operate with the warden in any adjoining district or town, and in his absence assume control therein. Each may arrest, without a warrant, any person found violating any provision of this chapter, and take him before a magistrate, and there make complaint; and when a warden shall have information that such violation has been committed, he shall, without delay, make similar complaint and endeavor to have the case vigorously prosecuted. He shall not be required to give security for costs of prosecution, nor to pay any cost of prosecution. Wardens shall go to the place of danger to control or prevent fires, and in emergencies may employ or compel assistance.

SEC. 3. The *forester* shall divide into districts the territory exposed to forest or prairie fires, and, *for such period as he deems necessary*, employ for each district a ranger *or patrol*, who, *in addition to the duties herein prescribed*, shall have the power and perform the duties of fire wardens, go quickly over his district to see that fires are prevented or extinguished, and shall inspect, assist or compel the activity of local wardens. He shall by frequent reports keep the *forester* informed of his movements. He shall inform himself of the location of timber belonging to the state and use efforts to protect it from fire and trespass. In the employment of rangers, preference shall be given to cruisers or woodsmen, game wardens and forestry students who are known for reliability and efficiency. Each shall perform service in any district to which he is assigned. Rangers shall be paid for their services by the state out of the emergency fund, on verified vouchers, approved by the *forester and advisory board*, at the rate of not exceeding five ($5.00) dollars per day for the time actually employed and necessary and reasonable traveling expenses, and for which receipts shall be attached to their vouchers, the same to be filed in the State Auditor's office. *For the payment of such services and for the services of patrols along railroads and of persons employed in preventing and suppressing forest and prairie fires in dry and dangerous weather, and other necessary expenses, there is hereby annually appropriated out of any money in the treasury not otherwise appropriated the sum of two hundred thousand dollars, or so much thereof as may be necessary.*

SEC. 4. The *forester* shall investigate the state forests, and the causes and effects of fire therein; the quantity and character of the timber, and methods used to promote its regrowth, and other facts relating to forest interests. He shall report to the *advisory board* annually touching his official acts, making such recommendations as he shall deem proper. He shall co-operate with any force of the United States which may be detailed to protect property from fire. He shall prepare an abstract of the penal laws relating to forest and prairie fires, together with proper regulations and suggestions for the prevention and control thereof, and before April 1 in each year shall forward printed copies to all fire wardens, railroad companies and chairmen of county boards. The wardens shall post such abstract in numerous conspicuous places in their respective districts, and the *forester* may require any county board to cause at least three weeks' published notice thereof to be given.

SEC. 5. In any dry and dangerous *weather*, the *forester* may use such means as he shall deem necessary to prevent or suppress forest and prairie fires. And whenever the local officials shall neglect to prosecute violators of any law relating to forest and prairie fires, the *forester* shall prosecute the same, and the cost of such prosecution, not exceeding *thirty* thousand dollars in any year, shall be paid by the state, *which amount*, or so much thereof as may be necessary, *is* hereby appropriated annually for the purposes of this section.

SEC. 6. Each fire warden shall be paid for actual service at the rate of twenty-five cents per hour and actual and necessary traveling expenses. and each employee or patrol at the rate of twenty cents per hour; *but no person shall be paid for controlling or suppressing fire where the service is rendered within a mile of his property or residence, and no one shall be paid for such service who is under eighteen years of age.* A fire warden or employee shall receive pay for use of team when plowing for the control of a fire or in hauling water. In an ordinary *year* the expense incurred for fire warden service and in suppressing fires shall be paid out of the state treasury on duly verified vouchers, approved by the proper town board and the *forester;* and one-half (½) the amount shall be reimbursed to the state by the county in which the expense occurred. The state auditor shall notify the proper county auditor of the one-half (½) amount that has become due from his county under the foregoing provisions, and such county auditor shall immediately draw and transmit to the state auditor a warrant on the county treasurer of his county in favor of the state for such amount. For forest preservation, including the expense of the *forester's* department and one-half the pay, in an ordinary year, of fire wardens and of persons assisting in preventing and suppressing forest and prairie fires, there is hereby annually appropriated out of any money in the treasury, not otherwise appropriated, the sum of *thirty*-five thousand dollars, or so much thereof as may be necessary. *The appropriations made by this section and by sections three and five shall be immediately available for any necessary expenditures.*

[NOTE—Wind is so liable to change that a person fighting fire a mile from his residence may be considered as protecting his own property.]

SEC. 7. Every person operating a threshing or other portable engine shall keep effective spark arresters thereon while in use, and no person shall deposit coals or ashes therefrom without safely covering or extinguishing the same. Every violation of any provision of this section shall be deemed a misdemeanor.

SEC. 8. Every warden or patrol, and every person lawfully commanded to assist *in extinguishing fire or* in enforcing any of the provisions of this chapter, who shall unjustifiably refuse or neglect to perform his duty; every person who shall kindle a fire on or near forest or prairie land and leave it unquenched, or be a party thereto, or who shall set fire to brush, stumps, dry grass, field stubble or other material and, *notwithstanding his efforts,* fail to extinguish the same before it has endangered the property of another; every person who shall negligently or carelessly set on fire, or cause to be set on fire, any woods, prairie, or other combustible material, whether on his own land or not, by means whereof the property of another shall be endangered, or who shall negligently suffer any fire upon his own lands to extend beyond the limits thereof; every person who shall use other than incombustible wads for firearms, or carry a naked torch, fire-brand, or exposed light in or near forest land, or who in the vicinity of such land shall throw or drop into combustible material any burning match, ashes of pipe, lighted cigar or any other burning substance, and who fails to immediately extinguish the same, and every person who shall deface, destroy or remove any abstract or notice posted under this chapter, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by fine of not less than fifty dollars and not exceeding one hundred dollars and costs of prosecution, or by imprisonment in the county jail not less than thirty days and not exceeding ninety days. Any person who maliciously sets on fire, or causes to be set on fire, any woods, prairie, or other combustible material, whereby the property of another is destroyed and lives sacrificed, shall be punished by a fine of not over five hundred dollars, or be imprisoned in the state prison for a term not exceeding ten years, or both such fine and imprisonment.

SEC. 9. Every person who between April first and November first starts a camp or other fire in the vicinity of forest or prairie land, for cooking, obtaining warmth or for any industrial purpose, shall exercise every reasonable precaution to prevent such fire from spreading, and shall, before lighting the same, clear the ground from all branches, brushwood, dry leaves or other combustible material within a radius of ten feet from the fire, and shall carefully extinguish the fire before quitting the place.

Every person who, alone or as principal of a party of several persons, intends to camp for one day or upwards on land not his own between the dates before mentioned in the vicinity of forest or prairie land, shall notify in writing the recorder of the village or the town clerk nearest to the proposed camp of his intention, stating definitely the site and probable time it will be occupied, and shall file with such recorder or town clerk a written promise to comply with the law in regard to camp-fires, and stating his place of residence and occupation. Such recorder or town clerk shall keep a record of the same. Any person making or occupying a camp in violation of these provisions shall be deemed guilty of a misdemeanor and on conviction thereof shall pay a fine of not less than fifty dollars and costs of prosecution or not exceeding one hundred dollars and costs of prosecution or be imprisoned in the county jail not less than thirty days nor more than ninety days.

SEC. 10. Every road inspector or assistant of a road inspector, or other officer having charge of the highway, who during a dry season has reason to believe that any traveler or wayfarer has left a camp-fire on any roadside in his district, shall without delay go to the place of such camp, and examine whether any fire has been left burning or smouldering; and if he finds fire in any such camp, he shall extinguish the same, also take prompt measures to prosecute the person or persons who so left such fire. It shall be the duty of every such highway officer, when requested by the warden, to render every assistance possible in preventing or extinguishing fires, and his pay for actual service shall be the same as that of a warden.

Sec. 11. *Between the first of May and fifteenth of November no one in clearing land or meadow shall set fire to brush, stumps or meadow in the vicinity of forest or prairie land without first making, by digging or plowing, a continuous fire-break not less than a rod wide of bare ground between the place of the fire and the property of another which might be endangered by the fire. A violation of this provision shall be deemed a misdemeanor punishable by imprisonment in the county jail not less than sixty days nor more than ninety days.*

Whoever under any circumstances sets fire must exercise care and precautions in proportion to the danger, and if the fire escapes and endangers the property of another it shall be no excuse that he did his best to control it. And, where fire is set by an employee by direction of his employer in violation of law, each shall be liable to the penalty prescribed.

SEC. 12. When it shall be shown in evidence from the appearance of the track of fire, or otherwise, that a fire, which spread from the land of one owner or occupant to land of another, had its origin on a tract upon which, at any time within three weeks previously to such spreading, the owner or occupant of the tract or his agent or any employee was using fire in clearing land or otherwise, the same shall be prima facie evidence that such owner, occupant, agent or employee was guilty of having by negligence caused such fire to spread, and on conviction he shall be deemed guilty of a misdemeanor. No appeal shall be allowed from a judgment in justice's court in any prosecution under this chapter unless the person appealing shall, within the legal time prescribed, enter into a recognizance with two sufficient sureties, surety company or cash bail, in twice the amount of the fine and costs, to be approved by the justice, conditioned to appear before the district court on the first day of the general term thereof next to be held in and for the same county, and abide the judgment of said court therein. The justice may examine the proposed sureties under oath, and in such case shall make and keep a record of their answers in respect to the kinds and amount of their property that is not exempt from execution, and furnish a copy of the same to the *forester.*

Sec. 13. *Any person or corporation who, between November first and April first, cuts or fells, or causes to be cut or felled, balsam, cedar, pine, spruce or tamarac trees for commercial purposes, shall at the time of cutting lop and burn the branches by piling them upon a fire. When the cutting is done between April first and November first, the branches shall be lopped at the time of cutting, but the burning shall not be done between those dates, but shall be done before the first of the following January, and in the manner above prescribed. Any such branches or slashings left unburned in violation of the foregoing provision shall be held to be detrimental to the public safety and a public nuisance, and the state shall, through any warden, ranger or patrol or other employee, under the direction of the Forester, go upon the premises and burn such slashings, and the expense thereof shall be a lien upon the land on which they are situated, enforced as liens for the improvement of real estate are enforced, and such expense shall be a prima facie valid claim that may be collected from the person or corporation who cut the wood or timber from which the slashings were made.*

Whoever cuts or fells, or causes to be cut or felled, for commercial purposes, any other kind of trees than above mentioned shall at the time of cutting lop the branches.

Any person or corporation who cuts or fells trees or bushes of any kind in clearing land for roadbed or right of way for any railroad, highway or trail shall in the manner and at the time as above prescribed burn the slashings, and all combustible material except fuel and merchantable timber.

Any person or corporation who cuts or fells trees or bushes of any kind in clearing land for agricultural or pasturage purposes, or who in any way clears land, is prohibited from setting fire to the slashings, brush, roots or excavated stumps or other combustible material on such land and letting the fire run; the material must be piled upon a fire, or be piled before being set on fire.

Any person who shall violate any of the provisions of this section shall be deemed guilty of a misdemeanor, and, on conviction thereof, be punished by a fine of not less than seventy-five dollars nor more than one hundred dollars, or by imprisonment in the county jail not less than sixty days nor more than ninety days.

[Under the present law people generally delayed burning until about the first of May, when it was dangerous; also, tried to burn too much at once. Many destructive fires were so caused. Also, many people evaded the law entirely.]

SEC. 14. Every company operating a railroad shall use upon each locomotive engine a good and efficient spark arrester, which the master mechanic shall cause to be examined, and the master mechanic and employee making the examination shall be held responsible for the good condition of the same, but without relieving the company from its responsibility hereunder. Every such company shall keep its right of way clear of combustible materials, except ties and other material necessary for the maintenance and operation of the road, from April 15 to December 1. No company shall permit any of its employees to leave a deposit of fire, live coals, or ashes, in the vicinity of woodland or lands liable to be overrun by fire, and every engineer, conductor or trainman discovering fire adjacent to the track shall report the same promptly at the first telegraph or telephone station reached by him. Every such company shall give its employees particular instructions for the prevention and extinguishment of fires, and shall cause warning placards furnished by the *forester* to be conspicuously posted at every station in the vicinity of forest and grass lands, and, when a fire occurs near the line of its road, shall concentrate such help and adopt such measures as shall be available for its extinguishment. Any company violating any provision of this section shall be neemed guilty of a misdemeanor, and, on conviction thereof, shall be fined not less than five hundred dollars and not exceeding one thousand dollars and costs of prosecution for each offence, and any railroad employee violating the same shall be guilty of a misdemeanor, and shall be punished by imprisonment in the county jail not less than sixty days and not exceeding ninety days.

Every company operating a railroad through forest, prairie or meadow land, shall, at its own expense, organize and maintain a competent and efficient *fire patrol to promptly discover and thoroughly extinguish any fire or fires which may be set or occur by sparks or coals from railroad engines upon the right of way of such railroad company, or upon land adjacent thereto; and, unless otherwise directed by the forester, such patrols shall be maintained continuously from April first to November fifteenth of each year. If any such company does not organize and maintain such fire patrol, or if in the judgment of the forester it does not organize and maintain such fire patrols which are sufficient for the purpose stated, then the forester shall organize and maintain such fire patrols in such manner and under such rules and regulations as he shall from time to time deem proper, and notify in writing the company thereof, and the expense thereof shall be paid on properly verified accounts approved by him and the advisory board out of any money in the treasury not otherwise appropriated. The forester shall keep, or cause to be kept, an account of the cost of organizing and maintaining such fire patrol along the line of any such railroad, including therein the salaries, expenses and wages of public officers or employees engaged in organizing and maintaining such fire patrol, and duly notify the company of the cost under such regulations as the advisory board shall prescribe; and the total cost thereof shall be paid into the state treasury by the railroad company along whose line or lands or rights of way such patrol is maintained, such payment to be made on the thirty-first day of December of each year. If any company neglects for thirty days after December 31st to pay such total cost, it shall be subject to a penalty of twenty-five per cent thereof and the whole amount may be collected by civil action by the Attorney General in the name of the state.*

SEC. 15. Whenever an arrest shall have been made for violation of any of the provisions of this chapter, or whenever information of such violation shall have been lodged with him, the county attorney of the county in which the criminal act was committed shall prosecute the accused with all diligence and energy. If any such county attorney shall fail to comply with the provisions of this section, he shall be guilty of a malfeasance in office, and shall be removed therefrom, and be disqualified from holding the same for and during the remainder of the term for which he was elected or appointed, and shall forfeit not less than one hundred dollars nor more than five hundred dollars, which amount may be recovered in an action against him personally or on his official bond. The penalties of this section shall apply to any magistrate with proper authority who refuses or neglects to cause the arrest and prosecution of any person or persons when complaint under oath of violations of any provisions of this act has been lodged with him.

SEC. 16. All fines collected for violations of this chapter shall be paid into the treasury of the county in which the conviction occurs and become a separate fund for defraying the cost of enforcing the provisions hereof in such county.

SEC. 17. All acts and parts of acts inconsistent with this act are hereby repealed.

NEW FORESTRY LAW.

The following act of the Minnesota Legislature, approved April 12, 1911, is the bill with some changes, drawn by the Forestry Board and introduced in the House of Representatives as the Forestry Committee's bill. As drawn and recommended by the Forestry Board it provided an annual tax of two-tenths of a mill for the forest service fund, and carried an appropriation of $50,000 for the fiscal year ending July 31, 1911, and $150,000 for the year ending July 31, 1912, and the salary of the State Forester was recommended at $5,000 and that of the Secretary of the Forestry Board at $2,500, the latter office to be filled by the Forestry Commissioner.

CHAPTER 125—LAWS OF 1911.

AN ACT to provide for the preservation of forests in this State and for reforestation and for the prevention and suppression of forest and prairie fires; also repealing Chapter 22, Revised Laws 1905, and Sections 2505, 2506, 2507, 2508, 2510 and 2515, Revised Laws, 1905; Chapters 82 and 310 of the General Laws of Minnesota for 1905; Chapter 182 of the General Laws of Minnesota for 1909, and all acts and parts of acts inconsistent with this act, and appropriating money for the carrying out of its provisions.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. There shall be a state forestry board of nine members, composed of the director of the forestry school and the dean of the agricultural college of the University of Minnesota, and seven others appointed by the governor for a term of four years and until their successors qualify. Two of said members shall be appointed upon the recommendation of the regents of the university, and of the following bodies: The State Agricultural Society, the State Horticultural Society and the State Game and Fish Commission—provided suitable persons be recommended by them to the governor not later than January 31 of the year in which such terms expire. All vacancies shall be filled the same as the original appointments. The members now in office shall hold through the terms for which they were respectively appointed. So far as practicable, all such appointees shall be appointed with reference to their knowledge of and interest in the planting and cultivation of trees in prairie regions, the preservation of natural forests, the reforesting of denuded lands and the protection of the sources of streams.

SEC. 2. The State Forestry Board shall appoint a secretary at a salary not to exceed eighteen hundred (1800) dollars per annum, whose duties shall be prescribed by the board.

SEC. 3. The board shall have the management of the forest reserves and of all other property acquired therefor, supervise all matters of forest protection and reforestation and have charge of all moneys appropriated therefor or accruing therefrom, including the forest reserve fund and the forest service fund. It shall ascertain and observe the best methods of reforesting cut-over and denuded lands, foresting waste and prairie lands, preventing destruction of forests and lands by fire, administering forests on forestry principles, encouraging private owners to preserve and grow timber for commercial purposes and conserving the forests around the head waters of streams and on the watersheds of the state, and shall collect information regarding the timber lands owned by the state. On or before the first Monday in December of each year the board shall report its doings, conclusions and recommendations, and any damage caused by forest and prairie fires and any trespassing upon state lands to the governor, which report shall be printed and distributed to the members of the Legislature and otherwise as the board may direct.

SEC. 4. The board shall elect a president and vice-president annually. It may appoint an executive committee on which it may confer authority to act for it in minor details which cannot conveniently be acted upon by the board. The board shall appoint a state forester who shall be a trained forester, at a salary not to exceed four thousand (4,000) dollars per annum, and he shall be allowed necessary traveling and field expenses incurred in the conduct of his official duties. The office of the state forester shall be at the state capitol, and the board is hereby authorized to employ such office assistants as may be necessary and to fix their compensation. The state forester, with the approval of the state forestry board, may appoint an assistant forester and such other employes, outside of the office assistants, as may be necessary in carrying out the provisions of this act, and fix the amount of their compensation; and the state forester shall have the power to remove any of such subordinate officers and employes so appointed by him. He shall be authorized under the direction and approval of the state forestry board to purchase all necessary equipment, instruments and field supplies. A full and accurate account of all receipts and expenditures incurred in the carrying out of the provisions of this act, with such vouchers and forms as may be recommended by the state public examiner, shall be kept in a system of books prescribed by such examiner. The state forester shall execute all rules and regulations issued by the state forestry board pertaining to forestry and forest protection within the jurisdiction of the state; have charge of the work of protecting all forests and lands from fire; shall investigate the origin of all forest fires and prosecute all violators of this act; shall prepare and print for public distribution an abstract of the forest fire laws of Minnesota, together with such rules and regulations as may be formulated by the state forestry board. He shall prepare printed notices calling attention to the dangers from forest fires and cause them to be posted in conspicuous places, and shall furnish same to the railroad companies, whose duty it shall be to post them in such places as he may direct.

SEC. 5. The state forester shall become familiar with the location and area of all state timber and cutover lands and prepare maps of forest reserves and each of the timbered counties showing the state lands therein, and shall supply such maps to the district rangers, to the officials of the state and counties requiring them, and in all ways that are practical and feasible shall protect such lands from fire and the illegal cutting of timber; he shall report from time to time to the board such information as may be of benefit to the state in the care and management of its timber. It shall be his duty to inquire into the extent, kind and condition of all timber lands; the amount of acres and value of timber that is cut or burned, and he shall also report the quantity and species of second growth timber, and shall not later than the first of December of each year make a written report to the state forestry board upon all such data ascertained by him, and shall recommend therein plans for improving the state system of forest protection, management and reforestation.

SEC. 6. The state forester shall co-operate with the state auditor and with the several departments of the State and Federal governments, or with counties, towns, corporations and individuals, in the preparation of plans for forest protection, management, replacement of trees, wood lots and timber tracts, using his influence as time will permit toward the establishment of scientific forestry principles in the management and promotion of the forest resources of the state.

SEC. 7. The state forester shall also co-operate with the state highway commission and with the supervising officers of the various towns and villages in the construction of firebreaks along section lines and public highways.

SEC. 8. The state forester may advance, as he deems wise, education in forestry within the state by publications and lectures, and upon the invitation of the director of the college of forestry of the university of Minnesota may co-operate with the said college so far as his time will permit, and such college shall furnish such aid to him as in the circumstances is consistent with its own proper functions.

SEC. 9. It shall be the duty of the state forester to audit and inspect all bills for salary and expenses incurred by the district rangers and by fire patrol for the suppression, checking and control of fires and recommend to the forestry board the amounts justly due and which should be paid.

SEC. 10. As soon as practicable after this act shall take effect, the state forester may, with the approval of the state forestry board, create and establish patrol districts, including all lands of both state and private ownership, upon which there is a probability of forest and brush fires starting, and establish rangers over the said districts.

SEC. 11. Under the direction of the state forester, the district rangers are charged with preventing and extinguishing forest fires in their respective districts, and the performance of such other duties as may be required by the state forester.

They may arrest without warrant any person found violating any provision of this Chapter, take him before a magistrate and there make complaint. When the district rangers shall have information that such violation has been committed, they shall without delay make similar complaint, and have the same prosecuted. The district rangers shall not be liable for civil action for trespass committed in the discharge of their duties.

SEC. 12. At any time district rangers, with the approval of the state forester, may employ suitable persons to be known as fire patrolmen permanently to remain upon and patrol such territory, state or private, as may be assigned to them as long as may be required to prevent and extinguish any fire. Each such patrolman so employed shall be supplied with the necessary equipment. The state forester and the district ranger may, and if they are absent and fires are actually burning in the forest the fire patrolmen may summon any male person of the age of 18 years and upwards to assist in stopping the fire, and may incur any other necessary and reasonable expense for the same purpose, but shall promptly report the same to the district ranger.

Any person summoned by any official of the state who is physically able and refuses to assist shall be guilty of a misdemeanor and shall be punishable by a fine of not less than $10.00 and not more than $25.00.

SEC. 13. When in the judgment of the state forester there is danger of the setting and spreading of fires from locomotive engines, he shall order any railroad company to provide patrolmen to follow each train throughout such fire patrol district or districts as he deems necessary to prevent fires. When the state forester has given a railroad company notice to provide such patrol after trains, the said railroad company shall immediately comply with such instructions throughout the territory designated; and upon its failure so to do, the state forester may employ patrolmen with the necessary equipment to patrol the rights of way of said railroad, and the expense of the same shall be charged to the said railroad company, and may be recovered in a civil action in the name of the State of Minnesota, and in addition thereto, the said company shall be guilty of a misdemeanor.

It is also made the duty of any railroad company, acting independently of such state forester, to patrol its right of way after the passage of each train when necessary to prevent the spread of fires and to use the highest degree of diligence to prevent the setting and spread of fires, to cause the extinguishment of fires set by locomotives or found existing upon their respective rights of way, and for any violation hereof such railroad company, its officers and patrolmen shall be guilty of a misdemeanor, and be punishable by a fine of not less than fifty (50) dollars nor more than one hundred (100) dollars and costs, and in addition thereto such railroad company shall be liable for all damages caused or permitted by it.

SEC. 14. Every company operating a railroad for any purpose shall equip and use upon each locomotive engine a practical and efficient spark arresting device which the master mechanic shall cause to be examined, and the same shall be examined by the master mechanic or some employes each time before leaving the roundhouse, except when snow is on the ground, and the master mechanic or employee making such examination shall be held responsible for the good condition of the same, but without relieving the company from its responsibility hereunder. Every such company shall keep its right of way clear of combustible materials, logs, poles, lumber, wood, except ties and other materials necessary for the maintenance and operation of the road, from April 15th to December 1st.

No company shall permit any of its employees to leave a deposit of fire, live coals or ashes in the immediate vicinity of wood land or lands liable to be overrun by fire, and every engineer, conductor or trainman discovering a fire adjacent to the track shall report the same promptly to the agent at the first telegraph station reached by him, whose duty it shall be as representative of such company to at once take necessary steps to put out such fire.

Every such company shall give its employees particular instructions for the prevention and extinguishment of fires, and shall cause warning placards furnished by the state forester, to be conspicuously posted at every station in the vicinity of forest, brush and grass lands, and, when a fire occurs on the right of way of its road, shall immediately concentrate such help and adopt such measures as shall be available for its extinguishment.

Any company violating any provision of this section shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined not less than fifty dollars and not exceeding one hundred dollars and costs of prosecution for each offense, and any railroad employee violating the same shall be guilty of a misdemeanor, and shall be punished by a fine of not less than twenty-five dollars nor more than one hundred dollars and costs of prosecution, or by imprisonment in the county jail not exceeding ninety days.

SEC. 15. Where and whenever in the judgment of the state forester there is or may be danger of starting and spreading of fires from slashings and debris from the cutting of timber of any kind and for any purpose, the state forester will notify the individual, firm or corporation, by whom the said timber has been or is being cut, ordering them to dispose of the slashings and debris as he may direct. Where conditions do not permit the burning of the slashings and debris over the entire area so covered, the state forester may require the person, firm or corporation by whom the timber was cut, to dispose of such slashings and debris in such a way as to establish a safe fire line around the area requiring such protection, the said fire line to be of a width and of a character satisfactory to the state forester.

When any person, firm or corporation shall have been notified by the state forester to dispose of slashings and debris, either by entirely consuming the same or establishing a fire line sufficient for the protection of adjoining property, and fails to comply with such instructions, the said person, firm or corporation shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not less than $50.00 and not exceeding $100.00 and costs of prosecution for each violation thereof or failure to comply therewith.

When any such branches, slashings or debris are left unburned contrary to the instructions of the state forester, the state forester may go upon the premises with such force of men as may be necessary, and burn such branches, slashings and debris, and the expense thereof shall be a lien upon the land on which they are situated, enforced as liens for the improvement of real estate are enforced, and such expense shall be a prima facie valid claim that may be collected from the person, firm or corporation who cut the timber or wood from which the said slashings and debris were made.

SEC. 16. Any person or corporation who cuts or fells trees or bushes of any kind in clearing land for roadbed or right of way for any railroad, highway or trail, shall in the manner and at the time as above prescribed burn the slashings, and all combustible material except fuel and merchantable timber.

Any person or corporation who cuts or fells trees or bushes of any kind in clearing land for agricultural or pasturage purposes, or who in any way clears land, is prohibited from setting fire to the slashings, brush, roots or excavated stumps or other combustible material on such land and letting the fire run; the material must be disposed of pursuant to the regulations of the state forester.

Any person who shall violate any of the provisions of this section shall be deemed guilty of a misdemeanor, and on conviction thereof be punished by a fine of not less than twenty-five dollars, nor more than one hundred dollars, or by imprisonment in the county jail for not less than ten days nor more than ninety days.

Sec. 17. The wages and expenses of men summoned or employed to fight forest fires actually burning, shall be fixed and paid for by the state forester and the labor reckoned and paid for by the hours of labor performed, which shall not exceed the rate of 25 cents per hour employed; provided, no pay shall be given for fighting fire within one mile of the residence of such person, unless employed by the state forester or his assistants. The forestry board is authorized to draw out of the money appropriated by this act a reasonable sum, not to exceed five thousand (5,000) dollars at any one time, from the state treasurer and place the same in the hands of the state forester to be used by him in paying emergency expenses, and the state auditor is authorized to draw his warrant for such sum when duly approved by the president and secretary of said board. The state forester shall take proper sub-vouchers or receipts from all persons to whom such funds are paid, and after the same have been approved by the state forestry board they shall be filed with the state auditor.

Sec. 18. Every employee of the state forestry board and every person lawfully commanded to assist in enforcing any of the provisions of this chapter, who shall unjustifiably refuse or neglect to perform his duty; every person who shall kindle a fire on or near forest, brush or prairie land and leave it unquenched, or be a party thereto, or who shall set fire to brush, stumps, dry grass, field, stubble or other material and fail to extinguish the same before it has endangered the property of another; every person who shall negligently or carelessly set on fire, or cause to be set on fire, any woods, prairie or other combustible material, whether on his own land or not, by means whereof the property of another shall be endangered, or who shall negligently suffer any fire upon his own lands to extend beyond the limits thereof; every person who shall use other than incombustible wads for firearms or carry a naked torch, firebrand or exposed light in or near forest land, or who, in the vicinity of such land, or throw or drop into combustible material any burning match, ashes of pipe, lighted cigar, or any other burning substance, and who fails to immediately extinguish the same, and every person who shall deface, destroy or remove any abstract or notice posted under this chapter, shall be deemed guilty of a misdemeanor and on conviction thereof shall be punished by a fine of not less than twenty-five dollars and not exceeding one hundred dollars and costs of prosecution, or by imprisonment in the county jail not less than ten days and not exceeding ninety days.

Sec. 19. All villages and cities in the state situated in the timber area are hereby authorized, and all such municipalities where the same is possible so to do are hereby directed to clear off all combustible material and debris and create at least two good and sufficient fire breaks of not less than ten feet in width each, which shall completely encircle such municipalities at a distance of not less than twenty rods apart, between which back fires may be set or a stand made to fight forest fires in cases of emergency.

It is hereby made the duty of the district rangers to report to the state forester any failure to comply with the provisions of this section or any violation of this act, and any failure so to do shall be punished by a fine of not less than twenty-five dollars, nor more than one hundred dollars.

Sec. 20. Every road overseer or assistant of a road overseer or other local officer having charge of the highway, who finds that any person has left a camp fire burning in his district, shall extinguish the same, and take prompt measures to prosecute the person or persons who so left such fire.

SEC. 21. Every person who, when the ground is not covered with snow, starts a fire for any purpose not hereinafter specified in this act, in the vicinity of forest or prairie land, shall exercise every reasonable precaution to prevent such fire from spreading, and shall before lighting the same clear the ground from all branches, brushwood, dry leaves and other combustible material within a radius of ten feet from the fire, and shall carefully extinguish the fire before quitting the place.

SEC. 22. Whoever under any circumstances sets fire, must exercise care and precaution in proportion to the danger.

Whenever a fire set by any person or corporation spreads to and destroys property belonging to another, it shall be prima facie evidence that the party so setting such fire is guilty of negligence in setting the same and allowing it to spread.

SEC. 23. No appeal shall be allowed from a judgment in justice's court in any prosecution under this chapter unless the person appealing shall, within the legal time prescribed, enter into a recognizance with two sufficient sureties, surety company or cash bail, in twice the amount of the fine and costs, to be approved by the justice, conditioned to appear before the district court on the first day of the general term thereof to be held in and for the same county, and abide the judgment of the said court therein.

The justice may examine the proposed sureties under oath, and in such case shall make and keep a record of their answers in respect to the kinds and amount of their property that is not exempt from execution, and furnish a copy of the same to the state forester.

SEC. 24. The state forester may appoint supervisors, constables and clerks of towns, mayors of cities and presidents of village councils, fire wardens for their respective districts, and it is hereby made their duty to do all things necessary to protect the property of such municipalities from fire and to extinguish the same.

All towns, villages and cities are hereby authorized and directed to take necessary precautions to prevent the starting and spreading of forest or prairie fires and to extinguish the same, and are hereby further authorized to annually levy a tax of not more than five mills upon a taxable property of such municipalities, which, when collected, shall be known as the "Fire Fund," which shall be used in paying all necessary and incidental expenses incurred in enforcing the provisions of this act.

In all townships constituted within any of the forest patrol districts which may be established by the state forestry board, the respective town and village officers shall co-operate as far as possible with and act under the general supervision and direction of the state forestry officers.

SEC. 25. All moneys received as penalties for violations of the provisions of this act, less the cost of collection and not otherwise provided for, shall be paid into the treasury of the county in which the penalties for said violation of the provisions of this act were imposed.

SEC. 26. There is hereby appropriated from the general revenue funds of the state out of any moneys not otherwise appropriated, the sum of $15,000 for the fiscal year ending July 31, 1911, $75,000 for the fiscal year ending July 31, 1912, and $75,000 for the fiscal year ending July 31, 1913, which shall be credited to the Forest Service to be used therefor as provided in this act. The manner of presenting claims to the state auditor and payment of the same shall, so far as practicable, be in accordance with Chapter Ninety-six (96) of the General Laws of Minnesota for 1905. Itemized vouchers of all expenses shall be approved as directed by the forestry board.

SEC. 27. Whenever the word "board" is mentioned or referred to in the forestry laws of the state of Minnesota it shall mean the state forestry board herein created.

SEC. 28. Chapter 22, Revised Laws, 1905, and Sections 2505, 2506, 2507, 2508, 2510 and 2515, Revised Laws, 1905; Chapters 82 and 310 of the General Laws of Minnesota for 1905; Chapter 182 of the General Laws of Minnesota for 1909, and all acts and parts of acts inconsistent with this act are hereby repealed.

Approved April 12, 1911.

WHAT PUBLIC SCHOOLS CAN DO.

There are moments in every public school when an intelligent teacher can impart useful sentiments without being tiresome. In the forest and prairie portions of the state every teacher should impress upon the pupils the importance of being very careful in the use of fire. A few years ago a little girl in Marshall county was burned to death by a prairie fire while returning home from school. About eight years ago two little boys in Morrison county set fire to high grass in the fall so they could find a cow bell. The fire spread through meadows twelve miles and burned hay worth two thousand dollars belonging to a number of poor settlers, some of whom had to sell their only cow, causing want to young children. These are some of the lesser examples of injury occasioned by thoughtless negligence in the use of fire.

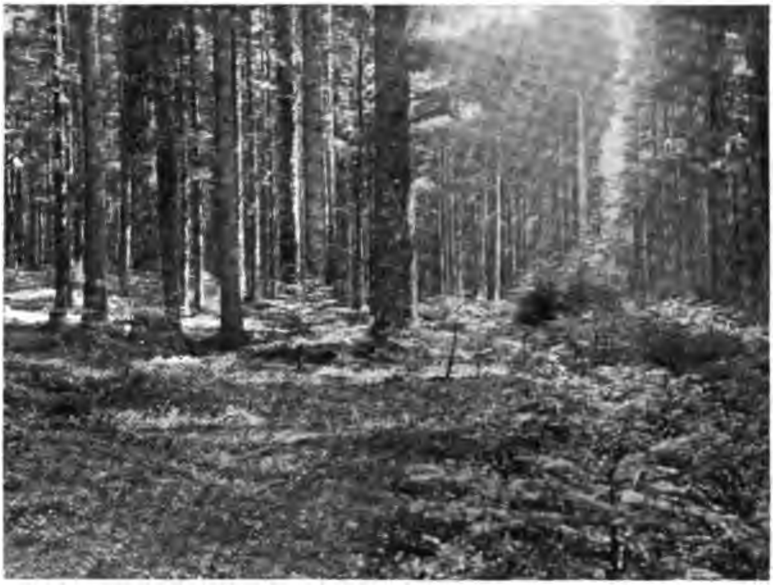
With the hope that the public schools would take this matter up in a proper manner, I *eight years ago* addressed a letter to Mr. Olson, the then Superintendent of Public Instruction, of which the following is a copy:

OFFICE OF CHIEF FIRE WARDEN,
ST. PAUL, July 1, 1903.

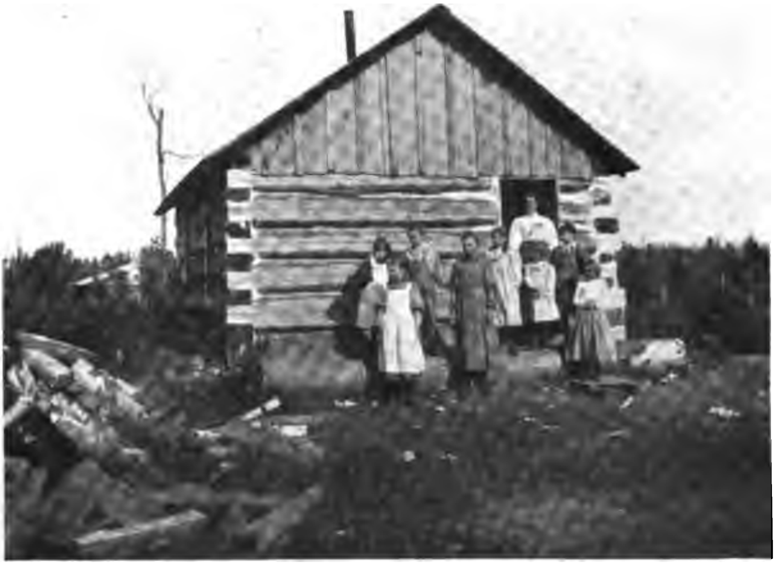
HON. J. W. OLSON,
Superintendent of Public Instruction,
State Capitol.

DEAR SIR: Not long ago I heard a young American who had just taken his post-graduate studies in Germany relate that at the close of a little picnic party in a forest which he attended with a few native German friends, he set on fire a few small paper boxes and pieces of paper in which refreshments had been brought, yet making no more fire than he could stamp out in a minute with his feet, but that his act caused an outcry of intense though kindly remonstrance on the part of the Germans as if he had committed almost an unpardonable offence.

This illustrates the scrupulous deference paid in European countries, where forestry is practiced, to regulations against forest



Compartment division line kept clear in a spruce and fir forest. Forest cover pretty full. Very few little trees except in the opening. In the Black Forest, Germany.



Public school house in the forest region of Northern Minnesota. Shows dangerous situation from the surrounding combustible material. In the area of the Baudette fire of October, 1910, a family saved their lives by having seasonably cleared the ground around their dwelling from combustible material.

fires, a deference which has grown from more than a century of habit which has been fostered not a little by the injunctions of the school teacher.

The scrupulous care which shall make forest fires of rare occurrence in this country must be the growth of generations, and I believe school teachers can do much to instill the habit.

Thousands of people from various parts of our state visit the forest every year for recreation, and they have a right to do so. Everyone is interested in the good condition of the forest.

The material value of Minnesota's natural forest resources is something which every school child may well have some general idea of. What a munificent school fund has grown and is growing from land and forest in our state! Minnesota's forest long has been and long should be the benign mother of wages. The original pine forest in our state, with other timber tracts and waste places interspersed covered 18,000,000 acres; and there are now 9,000,000 acres of more or less forested land.

Aside from direct pecuniary benefit, such as timber products and fuel, the forest affords many indirect benefits in which the public has a deep interest, such as amelioration of climate, water supply, covert for game, beauty of landscape and scenery.

Forest fires are very seldom caused with intent to do wrong, but by carelessness. They are sometimes caused by burning dry grass in meadows, burning tops and branches of trees left after logging, clearing land, setting fire by hunters to make pasture for deer, by mineral explorers, timber and land cruisers, campers, hunters, by pleasure parties, by people lighting cigars or pipes, and by sparks from railroad locomotives.

When fire occurs in a city or village there is generally an abundance of water at hand and a trained force with efficient apparatus for its extinguishment. Also property destroyed by fire in cities and villages is generally insured.

On the contrary, forest fires generally occur remote from roads and water, difficult if not impossible of access, and the property they destroy is of a kind that cannot be insured. When a forest fire gets under full headway it is seldom that human power can extinguish or control it.

About the only way to put out forest fires is to prevent them. Prevention is the one great thing.

What is most needed to prevent forest fires is an intelligent and general comprehension on the part of the people of the great injury such fires can do to human life, property, landscape and scenery, and a universal habit of extreme care in the use of fire in a dry season within or in the vicinity of forests.

If it becomes necessary to start a fire in the woods in a dry season, then no larger fire should be started than can be easily controlled. The earth should first be dug or scraped around to prevent any possibility of its spreading. It should not be left till one is sure—doubly sure, it is extinguished.

In the course of about twenty years three forest fires occurred in the Northwest that proved historic calamities. Each made a holocaust of human beings. They were pointed at in Europe as phenomena of the western world. (There have since occurred in Minnesota the Chisholm and Baudette fires.)

Under all the circumstances I have felt that it would not be improper for me to ask you, as I now beg to do, to instruct the public school teachers of our state to impress upon their pupils, from term to term, the utility and wisdom of exercising strict care in the use of fire in the vicinity of forests, and to inculcate in their minds respect for the state's regulations for the prevention of forest fires.

Very truly yours,

C. C. ANDREWS,
Chief (Forest) Fire Warden.

Two Hundred and Twenty-Five Minnesota Fire Wardens Think Slashings Should Be Burned at Time of Cutting.

CIRCULAR 39. { STATE OF MINNESOTA, OFFICE OF FORESTRY COMMISSIONER.

ST. PAUL, MINN., Feb. 1, 1911.

Before the meeting of the legislature the Forestry Commissioner sent inquiries to fire wardens (town supervisors) relative to new legislation. To the questions, "Is it practicable and wise to require the burning of slashings at the time of cutting? If a good fire be started, even when snow is on the ground, and brush piled upon it, can it not be burned cheaper at the time of cutting than at any other time?" There were many who gave negative answers, but affirmative answers were given by the following. The name of each warden's town is given.

AITKIN COUNTY.

O. Pearson, Fleming. Yes, when the snow is not too deep.

W. A. Eastwood, Hebron. Yes, I think so.

A. C. Nelson, Hebron. I think that evergreen slashings should be burned at once.

J. P. Carlson, Malmo. Yes.

Ole O. Hoven, McGregor. It can be done but in some seasons it will be very expensive.

Frank Rogers, Workman. Yes.

A. Pitchel, Waukenabo. Yes, it can and is done during winter and spring.

Henry Kuhlman, Wagner. It can be done cheaper at the time of cutting.

E. E. Reynolds, Pequadua. Yes, if burned at the time of cutting it does not destroy the timber left standing.

BECKER COUNTY.

O. P. Nelson, Burlington. Yes.

Abram Haataja, Spruce Grove. Yes.

H. H. Frankner, Two Inlets. Yes.

BELTRAMI COUNTY.

L. F. Bjella, Frohn. Yes, that is the cheapest way and the only way to save the standing timber.

Edward Barnerd, Eland. Yes, I cut a lot of timber last winter and burned the brush, as I cut it. It is cheaper to burn them then than in the spring, and does a better job.

Nels Nelson, Eland. Yes, I am at this writing burning the green brush with four inches of snow on the ground, and the brush burns up as fast as I can put it on. I believe this is the best method for burning brush, and would like to see a law to that effect for the benefit of public safety.

John Bergquist, Hagali. The brush can be burned in winter as cutting progresses by starting a fire and piling the branches on it. If the slashings are to be burned before March first, then it will be cheaper to burn the brush as the cutting progresses.

I. A. Wagner, Keliher. Brush should be piled and burned, but that is never done.

I. A. Engelson, Lee. Yes.

P. J. Reack, Lammers. Think it practicable to burn brush at time of cutting.

G. H. Welder, Myhre. It would be wise if this could be made a law, to compel people to burn at time of cutting. It would be cheaper in the long run and would be far safer. Big lumber companies at least should be made to burn their slashings at time of cutting.

Peter M. Leonard, Nebish. Yes; pine, cedar, spruce and balsam should be burned before March first. If they get started when dry with a light wind it is absolutely impossible to do anything with it.

W. A. Worth, Northern. Yes, I know from practical experience that they can burn any kind of brush when snow is on the ground. I have started a fire right in the snow and after it got started the brush would burn as fast as I could get it there. I have burned all kinds of brush.

C. O. Glidden, Northern. Yes, I think the state ought to have a warden to patrol certain districts to see that the brush and slashings are burned at the time of cutting, especially in lumber camps.

Wm. Sjagren, Quiring. Yes

Thos. P. Dooher, Quiring. Yes, I think slashings can be burned cheaper at time of cutting, as I tried it myself last winter.

And. Solberg, Spruce Grove. Yes, as it leaves no chance of leaving or neglecting it later.

CARLTON COUNTY.

John G. Carlson, Atkinson. Yes, on high ground; in swamps slashings should not be burned, as it kills the swamp timber.

G. A. Ferguson, Beseman. I believe it is both practicable and wise to burn slashings at time of cutting.

Henry Groth, Beseman. Yes.

Frank Nord, Eagle. Yes, slashings can be burned in the winter when snow is on the ground.

J. H. Embree, Holyoke. Yes.

A. S. Clemons, Knife Falls. Yes, so far as it applies to large timber loggers and tie-makers; also pulpwood men tell me that they find it to their advantage to do so.

W. Westholm, Moose Lake. Yes.

Geo. H. Palmer, Wrenshall. I think the slashings should be burned at once. They could all be burned before March.

Hans O. Halvorson, Split Rock. Yes, I for my part think it is cheaper and safer to burn as cutting is going on.

CASS COUNTY.

Henry Meyer, Ansel. It would be best to burn slashings at time of cutting. Fire we had last summer started in slashings left by lumbermen.

F. Van Blaricorn, Birch Lake. In cases where timber is being cut for commercial purposes, it is well to burn the slashings as they are cut.

Knute Myking, Byron. My opinion is that it is practicable and should be done.

G. H. Toble, Gould. Yes, I think if it be required to burn brush it is better to burn it then.

A. A. Tusler, Hackensack. It is a very good idea.

O. O. Richland, Hiram. Yes.

Geo. Snell, Island Lake. It is the best time to burn, as fast as it is cut.

J. T. Smith, Island Lake. I think so, and it is safe.

Mark Snell, Island Lake. It should be piled and burned when cut.

John Hylen, Maple. Yes.

Wm. H. Luffman, Maple. Yes.

Geo. H. Hanson, Meadow Brook. That is one of the best provisions.

H. M. Hanson, Meadow Brook. I believe the proper time to burn slashings is at the time of cutting. If such was the law it would not so often be neglected

J. R. Thompson, Moose Lake. Yes.

Peter Nelson, Moose Lake. Yes, I think it can be burned cheaper and safer.

DeLoss Shepard, Meadow Brook. Yes, I think it is practicable and the only time it should be done.

CHISAGO COUNTY.

J. A. Lindahl, Fish Lake. Yes, it is. I have tried it myself and it worked fine.

A. J. Levander, Lent. Yes.

John Badien, Lent. Yes, if a good fire is started anything can be burned, and it can be done cheaper and safer when done at time of cutting.

J. A. Lindquist, Lent. Yes.

CLAY COUNTY.

Wallace Fountain, Hawley. Yes, decidedly so.

H. G. Olson, Hagen. Yes.

M. O. Holte, Keene. Yes.

Olaus Holte, Keene. This is the only practicable method.

Sam Rustad, Kurtz. Yes.

E. Carlson, Morken. Yes, brush will burn even if wet with snow.

Bert Halterman, Riverton. Yes.

O. G. Tweeton, Tansem. Yes.

F. W. Horn, Viding. Yes.

CLEARWATER COUNTY.

H. C. Teigland, Bear Creek. Slashings should always be burned at time of cutting, in my opinion, as it can be done cheaper then.

L. J. Logelin, Greenwood. Yes, and I think it would be just as cheap to burn at once.

Rudolph Hanson, Hangaard. Yes, slashings can be burned just as cheap when snow is on the ground.

Albert Anderson, Leon. Yes.

D. M. Edwards, Moose Creek. Yes, cheaper.

H. P. Becker, Nora. Yes.

C. P. Highberg, Rice. I am convinced that slashings can be burned cheaper at the time made than any time later.

O. E. Evenvold, Shevlin. To burn the brush at time of cutting is best and cheapest.

L. D. Larson, Sinclair. Yes.

COOK COUNTY.

Hans Kasper, Colville. It is sensible and most necessary to have the slashings burned at time of cutting.

Wm. Daniels, Colville. I believe the brush could be piled at time of cutting and burned before the first of March.

Frank E. Bean, Rosebush. Yes, that is the time to burn them.

CROW WING COUNTY.

F. Norcross, Bay Lake. Yes.

J. J. Waffensmith, Bay Lake. Yes.

C. R. Skillings, Bay Lake. Yes.

Arthur M. Crapo, Klondike. In regard to pine and tamarac it could be done.

Geo. E. Hughes, Little Pine. Yes.

David Erickson, Watertown. Yes, if brush were piled and burned as it is cut, it would burn, provided it was done before it snowed on it.

HUBBARD COUNTY.

P. A. Christenson, Akeley. It would be practicable to burn slashings between cutting and March 1st.

Geo. Thietje, Clay. Think it is practicable and think it wise for a company cutting to have brush burned as soon as logs are taken or skidded away.

A. J. Holman, Clay. My experience has been that green timber can be burned at the time of cutting.

Ed Thoran, Farden. Burn slashings at time of cutting.

P. O. Snustad, Farden. Yes.

H. W. Warner, Guthrie. Yes

John Wright, Guthrie. Yes, it can be done and should be.

Fred Ames, Guthrie. It is practicable and wise to require the burning of slashings at time of cutting.

C. J. Juenke, Hart Lake. Yes.

P. M. Brevig, Helga. I think it wise to require the burning of slashings in lumbering operations before the snow is off the ground.

L. E. Marshall, Mantrap. Yes, most assuredly, from the viewpoint of conservation.

Chas. E. Brandt, Todd. I think it both practicable and wise and can be done with but little extra labor.

John H. May, Todd. Yes, I think that is all right, though it makes more work for a settler.

ITASCA COUNTY.

A. H. Delap, Alvewood. Yes.

R. H. Parry, Bass Lake. I think it much cheaper and better to burn as fast as cut in most timber, but poplar will not burn while green.

Harry Burnell, Bearville. It is wise to burn slashings at time of cutting.

Oscar J. Olson, Bearville. This would be a very good way, as the way it is now the loggers have a chance to get away before time of burning.

Stanley Booth, Carpenter. Yes, make all loggers and jobbers burn before breaking camp.

S. M. Brandon, Deer River. If burned at all, it should be burned at time of cutting.

D. Barclay, Greenway. Yes, I believe it is practicable. Snow would not interfere.

Gust L. Peterson, Good Hope. Yes, I think it is about the only time loggers could be made to burn their brush.

J. C. Downs, Iron Range. Yes, it can be burned at time of cutting.

H. M. Sword, Lake Jessie. It is both practicable and wise to require the burning of slashings in the winter time.

Mike Quistak, Moose Park. The above is correct.

Louis Nelson, Moose Park. Slashings can just as well be burned at time of cutting.

Mike Kupchos, Moose Park. If people would go according to this law many lives would be saved.

M. J. Downey, Nashwauk. It will be very wise to have slashings burned before March first.

W. J. Ibbotson, Popple. It is, with possible exceptions of soft, snowy weather.

S. C. Hooker, Wawina. My experience is that at the time of cutting, is the only time to burn slashings.

ISANTI COUNTY.

Geo. Gercliss, Athens. Yes.

J. D. Sarner, Dalbo. Yes, this suggestion should become a law.

C. E. Lechlin, North Branch. Yes, if done it would prevent many dangerous fires.

Chas. Nelson, Oxford. I think it would be a good plan.

C. J. Bellin, Oxford. It can be done cheaper while the snow is on the ground

KITTSON COUNTY.

Ole Nickelson, Arvenson. Yes.
G. M. Gillespee, Cannon. Yes.
A. J. Surter, Clow. Yes.
W. Kerns, Hill. Burn in the winter.
P. O. Phlin, McKinley. Yes.
S. F. Flugstad, Norway. I think it is.
C. J. Carlson, Pelan. Yes.
C. E. Kelso, Pelan. Yes.
And. Vik, Percy. Yes.
A. E. Engemann, Red River. Yes, slashings should be burned at time of cutting.
P. Lindahl, Red River. Slashings should be burned at time of cutting.
Jacob Wallenberg, St. Joseph. Yes, it is practicable and wise to require the burning of slashings when there is snow on the ground.
Nels S. Lindgreen, Svea. Yes.
A. Hanson, Svea. Yes.

KOOCHICHING COUNTY.

O. M. Hanscom, Bear River. Yes.
A. A. Tone, Bridgie. Yes.
Peter Moe, Dinner Creek. In my opinion slashings made in winter should be burned when made.
Henry Anderson, Plum Creek. It is the safest way.

MAHNOMEN COUNTY.

A. J. McIntosh, Beaulieu. Time to burn slashings is in the winter.
M. H. Nelson, Heier. Yes.

MARSHALL COUNTY.

B. O. Sathre, Como. I think it is practicable, and can be done safely.
J. M. Ronkin, Como. Yes.
V. P. Marsh, Middle River. All slashings may be burned within two weeks after cutting, hardwood included. They should be burned before March first.
E. P. Monson, Moose River. Slashings can be burned while snow is on the ground.
Fred Solley, Moylan. Yes, it is practicable and cheaper too.
O. L. Olson, Spruce Valley. Yes, I think it is.

MILLE LACS COUNTY.

Gust Sundvall, Hayland. Yes.
Alex Berg, Hayland. Yes.
Peter Larson, Hayland. Yes.
Alfred Johnson, Hayland. Yes.
O. M. Nelson, Milaca. Yes, it is best to burn when cut.
N. E. Mollan, Milaca. Yes.
Lars Erickson, Onamia. Burn the slashings at once.
Oscar Warner, Onamia. Yes.

MORRISON COUNTY

Herman Lennitz, Darling. Yes.
E. H. Johnson, Darling. Yes, that would be practicable.
J. H. Schumeker, Little Falls. Yes, I think so.
H. E. Van Alstine, Morrill. I think it should be done.
J. W. Crosby, Parker. It would be practicable and safe.

OTTER TAIL COUNTY

Geo. W. Moats, Inman. Yes.
L. R. Pochee, Lida. Yes.
H. E. Herbranson, Nodros. Yes, the above is a good plan.
J. Doll, Rush Lake. Yes.

PINE COUNTY.

J. H. Franklin, Anna. I think it is.
Swan Nelson, Birch Creek. Yes.
H. J. Berglund, Bruno. It can be done.
J. J. Vork, Dell Grove. Yes.
Geo. Smith, Dell Grove. Yes, and it ought to become a law.
Chas. Chase, Dorsey. It is certainly practicable and wise.
John Feury, Dorsey. Yes.
Louis Lindstrom, Fleming. Yes.
Nick Engells, Hinckley. It would be good to have the large lumber companies burn their slashings.
D. W. Shotwell, Munch. Yes.
Fred Degerstrom, Partridge. In cold, dry weather slashings burn good.
A. H. Anderson, Pokegama. Slashings should be burned at time of cutting.
E. Sandgren, Pokegama. This would be a good idea.

POLK COUNTY.

R. H. Linaberry, Brandt. Yes.
Albert Gunderson, Chester. That is a very good idea.
A. F. Michaels, Fanny. Yes, slashings can be burned without trouble.
A. L. Rud, Helgeland. It is a good plan to burn before March first.
Patrick Kelley, Gentilly. Yes, it can be done.

RED LAKE COUNTY.

Swan Sholin, Bray. Yes.
Ernest J. Kerlund, Bray. Yes.
Chas. Svendsgaard, Clover Leaf. Yes, in woods where lumber companies are operating.
Wm. Rose, Emmardville. Yes.
Paul Silvoenauer, Lake Pleasant. Yes.
M. Rud, Lambert. Yes.
S. S. Olson, Numedal. Yes.
C. E. Naplin, Polk Centre. Yes.

Aug. Krause, Sanders. It can be done cheapest when cutting.

W. E. Wood, Smiley. If slashings are not burned at time of cutting, they never will be except by forest fires.

ROSEAU COUNTY.

Michael Foldesi, Burnett. Yes.

P. E. Anderson, Deer. Yes.

A. J. Gilseth, Dieter. Yes.

E. P. Reeves, Mickendock. Yes, it ought to be piled and burned at time of cutting.

A. W. Gonshorewski, Polonia. This is the only time to burn.

Fred Andol, Pohlitz. That is the best time to burn.

T. S. Nornsland, Ross. If the burning of slashings are not done at time of cutting, it never will be done.

Jos. Marsik, Soler. Yes.

Henry Blazers, Soler. Yes.

Thos. Haug, Soler. Have the slashings piled and burned in the winter.

Alex Johnson, Spruce. Yes.

N. E. Nielsen, Spruce. Yes.

ST. LOUIS COUNTY.

Chas. Kangas, Pike. It certainly can be burned cheaper and better at time of cutting.

M. O. Kjos, Buyck. I think so.

Thos. Amundson, Buyck. The best thing to do is to burn the slashings as they are cut.

H. Hanson, Breitung. Yes, it is much safer when snow is on the ground.

Olaf Abrahamson, Canosia. The best way is to have a law compelling the burning of slashings as fast as cut.

A. M. Ohmen, Canosia. The best and surest way is to have brush burned at time of cutting.

W. C. McCrimmon, Canosia. That is the proper time to burn it.

Peter E. Michaels, Canosia. That is the best and safest way to burn the slashings, as cut.

A. O. Korhonen, Fine Lakes. By my experience this is the best time to burn slashings—at time of cutting.

A. W. Kroll, Grand Lake. Yes, it is best to burn at time of cutting.

John Peterson, Grand Lake. Yes, it is best to burn at time of cutting.

John Fredrickson, Kugler. It is practicable and wise to require the burning of slashings at time of cutting.

A. J. Lindstrom, Meadowlands. I am in favor of such a law.

H. Norman, Midway. Slashings could just as well be burned at time of cutting.

J. Michaels, Morris. Yes, if done before March first, there would be no forest fires.

C. A. Moline, Prairie Lake. Yes, it must be burned at time of cutting.

O. E. Moen, Prairie Lake. I think it is wise to require the burning of slashings at time of cutting.

Town Board, Rice Lake. Yes.

J. F. Gause, Solway. Yes.

J. E. Pellitier, Solway. Yes.

L. M. Brownell, District 2, Superior Reserve. Slashings and tops can be burned as they are made during the winter, and can be done cheaper.

John Kevisto, Wuori. It is practicable and wise to burn slashings at time of cutting.

Peter Arvola, Wuori. Yes, it is practicable to burn slashings as they are made.

Matt. Sarkella, Wuori. Yes, it is best to let them burn slashings at time of cutting. I know it can be done.

WADENA COUNTY.

Geo. M. Munson, Huntersville. Yes.

And. Miller, Lyons. Yes.

Geo. O. Phillipson, Lyons. Yes.

Chas. Anderson, Bullard. It is wise to require the burning of slashings at time of cutting.

Instead of a general law requiring the burning of slashings, suggestion has been made that the state forester determine and require just what slashings are dangerous and should be burned. Many bad fires get their start quite a distance from any valuable property, and it would be impossible for ever so faithful a patrol, ranger or warden to decide what slashings might not prove dangerous.

The law never demands impossibilities nor what is unreasonable. No sensible person would expect that slashings in a swamp covered with water would be burned.

Slashings were responsible for the Hinckley, Chisholm and Baudette calamities.

Under date of Ann Arbor, Mich., January 16, 1911, Dr. Filibert Roth, Professor of Forestry in the University of Michigan, and one of the most experienced and able foresters in our country, wrote me: "You are entirely right in sticking to the burning of brush."

Mr. Graves, chief of the United States Forest Service, in his Bulletin 82, says: "The most economical method of destroying brush and debris produced in lumbering is to burn it as the logging proceeds. * * * Small fires are started and, as the branches are cut off, the trimmers throw them on the nearest fire. * * * In coniferous forests the tops burn readily, even on the snow or in stormy weather."

I am only asking that coniferous slashings be burned at time of cutting.

C. C. ANDREWS,

Forestry Commissioner.

AMENDMENT TO CONSTITUTION FOR REFORESTATION.

Address of General Andrews, Forestry Commissioner, before students of the University of Minnesota, at 10:20 a. m., September 27, 1910.

The forest is the source of a leading industry. Every winter timber worth $10,000,000 as it stands is cut in the pine forests of northern Minnesota, giving employment to 20,000 workmen at good wages. When got to the mills its value has doubled, and its manufacture gives employment to more thousands of workmen. Pine timber will always be cut in Minnesota, yet as a leading industry our Minnesota forests will be exhausted in a dozen years. The reason why the state should begin a renewal of the forest is that individuals will not wait for a forest crop to mature. It is true that on good agricultural soil pine will grow to scant saw log size of twelve inches in diameter in forty years. But it would not be good economy to grow timber on land that would yield an annual field crop.

The great fact in forestry is that pine timber can be profitably grown on land that is too hilly, rocky or sandy for field crops. But on such land it takes pine on an average eighty years to grow to twelve inches diameter breast high, which is about the smallest saw log size that would be merchantable.

It is not true that reforestation will take care of itself. I have for years watched the condition of the cut-over pine lands in Minnesota. Take those from which the pine was cut twenty-five years ago and not more than five per cent of the area, on an average, has become well restocked—that is, close standing—with valuable kinds of trees. It would take nature unaided centuries to reproduce our pine forests. Nature has a better chance for reforestation in Prussia than with us, because very little damage is done there by forest fires, yet Prussia, not twice as large in area as Minnesota, replants 50,000 acres of her state forests annually.

Realizing the importance of making a beginning in reforestation, the last Minnesota legislature submitted an amendment to the constitution to be voted on the 8th of next November and which will require a majority of all votes cast at the election for its adoption, for an annual tax of one-fifteenth of a mill on each dollar of taxable property (only seven cents on each $1,000), and which will, if adopted, raise about $72,000 yearly and secure through the forestry board the purchase, at not exceeding $3 per acre, and planting on forestry principles, of 6,000 acres annually. We know from the experience of Germany that the average yield, eighty years after planting, would at least be 18,000 board feet per acre.

It is doubtful if enough interest can be awakened to secure the adoption of this amendment. But every lover of his state should do his best to arouse intelligent interest in its behalf. In years to come it will be a pleasure for you to look back and remember that you gave reforestation a helping hand.

VOTE ON THE PROPOSED CONSTITUTIONAL AMENDMENT FOR REFORESTATION, BY COUNTIES.

The proposed amendment to the constitution of Minnesota for a tax of one-fifteenth of a mill annually for reforestation, and which if adopted would have raised annually about $72,000, received 100,168 votes, but lacked 55,010 votes of being carried. Following is the vote by counties:

County	Yes	No	Total Number of Ballots Cast
Aitkin	399	600	1,533
Anoka	668	378	1,984
Becker	1,094	754	3,064
Beltrami	1,144	578	2,810
Benton	709	449	1,990
Big Stone	617	352	1,804
Blue Earth	2,041	1,127	5,704
Brown	1,159	741	3,566
Carlton	815	464	1,996
Carver	924	871	3,138
Cass	499	453	1,545
Chippewa	814	471	2,293
Chisago	694	411	1,960
Clay	1,246	754	3,314
Clearwater	411	249	1,053
Cook	173	43	358
Cottonwood	527	468	1,906
Crow Wing	994	696	2,695
Dakota	1,344	939	4,648
Dodge	417	338	1,447
Douglas	1,047	580	3,185
Faribault	890	637	2,927
Fillmore	1,288	795	3,557
Freeborn	1,383	784	3,687
Goodhue	1,886	1,188	5,241
Grant	351	350	1,324
Hennepin	8,505	2,563	43,903
Houston	742	535	2,409
Hubbard	687	348	1,638
Isanti	393	445	1,825
Itasca	1,001	1,629	3,886
Jackson	763	550	2,397
Kanabec	275	333	1,000
Kandiyohi	1,106	706	3,323
Kittson	416	438	1,384
Koochiching	549	336	1,242

VOTE ON THE PROPOSED CONSTITUTIONAL AMENDMENT FOR REFORESTATION, BY COUNTIES—Continued.

COUNTY	Yes	No	Total Number of Ballots Cast
Lac qui Parle	684	703	2,233
Lake	552	164	1,151
Le Sueur	862	1,190	4,116
Lincoln	595	344	1,876
Lyon	740	610	2,507
McLeod	751	694	2,616
Mahnomen	242	134	677
Marshall	1,094	538	2,823
Martin	958	668	3,080
Meeker	887	1,151	3,545
Mille Lacs	351	499	1,619
Morrison	1,338	884	3,586
Mower	1,272	791	3,643
Murray	636	465	2,156
Nicollet	813	519	2,258
Nobles	868	540	2,539
Norman	707	512	2,143
Olmsted	1,380	1,046	4,086
Otter Tail	1,762	1,431	5,670
Pine	738	587	2,468
Pipestone	564	315	1,491
Polk	2,458	1,638	6,451
Pope	881	378	2,151
Ramsey	12,528	5,006	29,499
Red Lake	1,295	795	3,825
Redwood	961	721	2,983
Renville	1,186	1,121	3,999
Rice	1,551	772	4,617
Rock	479	344	1,484
Roseau	684	315	1,663
St. Louis	6,784	3,241	16,088
Scott	438	446	1,806
Sherburne	296	307	1,194
Sibley	608	745	2,366
Stearns	1,753	1,760	6,116
Steele	1,134	851	3,595
Stevens	516	321	1,450
Swift	970	543	2,545
Todd	1,047	1,113	3,412
Traverse	501	260	1,310
Wabasha	1,246	792	3,992
Wadena	360	302	1,146
Waseca	485	1,029	2,575
Washington	1,283	606	3,758
Watonwan	655	337	1,826
Wilkin	553	334	1,587
Winona	1,887	1,387	6,014
Wright	1,106	973	3,721
Yellow Medicine	764	387	1,957
Totals	100,168	63,962	310,165

A bill to re-submit identically the same amendment was introduced in the Senate of the Legislature of 1911, favorably reported by the Judiciary Committee and Committee of the Whole, but finally, near the close of the session, on the ground of being a measure for revenue which should originate in the House, was indefinitely postponed. A similar bill was prepared and handed to the Chairman of the House Forestry Committee, but he thought it would be useless to try to get the rules suspended for its passage, and it was not introduced.

European Forests.

Through the kindness of a number of European forestry officials and of a few of the diplomatic representatives of the United States, I am able in this report to present sketches of the forests and forestry of twenty countries of Europe, as follows:

1. Alsace-Lorraine,
2. Austria,
3. Baden,
4. Bavaria,
5. Bulgaria,
6. Denmark,
7. France,
8. Hesse,
9. Hungary,
10. Italy,
11. Norway,
12. Prussia,
13. Russia,
14. Saxe-Meiningen,
15. Saxony,
16. Saxe-Weimar,
17. Spain,
18. Sweden,
19. Switzerland,
20. Wurtemberg.

ALSACE-LORRAINE.

STATE FORESTS.

Aggregate extent of the state forest is 346,318 acres. Besides, the state possesses, together with two towns and two villages, 40,630 acres of undivided forests. In Alsace-Lorraine we have to distinguish the mountain system of the Vogesen, the valley of the Rhine and the tableland of Lorraine. The highest point has 1,424 meters and lowest 106 meters. Prevailing kind of trees: Beech, oak, fir, pine and spruce. Fir and pine are, on an average, cut at the age of 120 years, and spruce at the age of 100 years. Branches that cannot be sold are burnt.

The timber is worked up and sold to the highest bidder; exceptionally by private contract.

The annual expense of administration, including forest guards, is $235,079. This does not include forestry instruction nor the purchase of additional lands. The annual revenue on the capital invested is 1.5 per cent.

A kind of selection cutting is mostly practiced. Of the cut-over land, sixty per cent becomes reforested by natural seeding. Thirty per cent by artificial planting and ten per cent by artificial sowing. In 1907, 3,131 acres were planted. Fir, spruce and beech are planted when at the age of from 3 to 5 years; 1.20 m., or about four feet apart; pine and oak at the age of from 1 to 2 years. The expense per acre, $10.

The damage by forest fires is very little. The means for preventing fires are, code of laws, fire-lines and watching by the forest guards.

For every 1,000 acres of forest 35 experienced forest workmen are employed.

On an average, 13,933 acres are under the supervision of a technically trained "Oberfoerster." Average salary, $1,000; allowance, $550, besides the use of unfurnished house or an equal compensation. After ten years a pension which increases from one-fourth to three-fourths of the salary. The highest forest official is the "Landforestmeister," with the rank of "Ministerialrat"; average salary, $2,200; allowance, $550.

Instruction in forestry is obtained in German forestry academies and forestry schools and in German universities.

PRIVATE FORESTS.

Aggregate extent of private forests, 723,310 acres, being owned by towns, villages, public institutions or private individuals.

The forests of the towns, villages and public institutions to the extent of 504,685 acres are managed on forestry principles. There is a certain supervision by the code of laws in consideration of clearing and reforestation.

The average value of the private forests may be roughly estimated at $225 per acre. The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one-half a cord of fuel.

The population of Alsace-Lorraine is 1,845,000. The area of the entire territory is 3,628,000 acres. The annual yield of raw material from the forests is 61.1½ cubic feet per acre. Of this amount, 45 per cent consists of timber, and 55 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cutting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to 1.5 cents per cubic foot. At this price the workmen earn 52 cents per day. The value of the timber, without bark, dragged to forest roads, is 11 cents per cubic foot, on an average. The value of fuel, piled up along roads, is 5.4 cents per cubic foot, or about $3.42 per cord. (The stumpage of timber is worth about $12 per 1,000 feet, board measure.) In the state forests about $100,000 are spent annually for road improvement and forest railroads. In the private forests the exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. Likewise in about half of the state forests the "Oberfoerster" manages the right of hunting by order of the government. In the state forests these leases yield annually 10 cents per acre. In the season of 1907, for instance, there were killed, in the administered districts of the state forests aggregating 189,580 acres, 303 head of red deer, 566 head of roe deer, 226 head of wild boar, 1,740 hares and 13 capercailzies, *tetrao urogallus* (mountain cock), besides a number of minor animals.

AUSTRIA.

STATE FORESTS.

The entire forest area of Austria is, in round numbers, 24,000,000 acres, of which the state administers 2,573,940 acres of actual forest, and of which 800,000 acres belong to religious, educational or charitable endowments. Under the Department of Forestry there are eight territorial offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58,993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.

Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.

Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the larch, occupying 5 per cent. A small area only is in possession

of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hardwoods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter decreasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However, spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata*) is mostly found mingled with beech, horn-beam and spruce. It does not run as high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europœa*) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris*) is found in the Alps and

in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.7 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia, Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca*) is very scarce on the whole. On the south slopes of the Vienna mountains it forms small forests. It is fond of the sunny side and of calcareous ground.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to $8.91. It is likely to range between $3.50 and $20 per acre, according to the possible yield.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, sylviculture, etc.	$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings...............	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc....................................	87,193.67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc..........................	418,499.05
V. For public expenses (taxes and charity expenses).	259,867.44
VI. Money refunded............................	756.13

VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of boundary lines, forest working plans, prescriptive rights, etc.)	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the ministry of agriculture)	151,340.20
Grand total expense	$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.)	$1,727,805.73
II. From agriculture (rentals from land leased, etc.)	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.)	291,747.02
IV. Money refunded	6,524.15
V. Extraordinary revenue	19,492.24
Total receipts	$2,207,161.30
To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at	290,336.40
Therefore grand total gross receipts	$2,497,497.70
Deducting from this amount the expenses previously mentioned, there remains a net revenue of	$693,741.81

Thus the entire state and fund forests of the Austrian empire have netted on an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of $28,586.01 for labor only. To these planting ex-

penses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper	$17,894.78
II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years	6,406.72
IV. Spades, picks, mattocks and other tools	834.02

Adding these items to the above named figure of $28,586.01, the grand total expense for replanting amounts to $55,416.49, or to $3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these, 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural

regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under the state forest management is pretty constant, whilst it is more or less subject to changes in the different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina being extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the logs than the inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two or three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission,

no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to $1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the time thus prescribed a second punishment shall take place." Paragraph 3: "Areas cleared from forests are to be planted up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to $3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 acres, and causing a loss of $163,904. On the yearly average, 601 forest fires have run over an area of 3,862 acres, involving $32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, while the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests, drawing a salary of $364 to $405 per annum, to which there must be added an additional pay varying from $64 to $162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration, drawing a salary of $445 to $526, with an additional pay varying from $81 to $202; eighth rank, a forest master, or inspecting officer, draws a salary of $567 up to $729 and an ad-

dition from $97 to $243; seventh rank, a forest counselor draws a salary of from $810 to $972 and an additional pay of from $142 to $283; sixth rank, a superior forest counselor draws a salary of from $1,134 to $1,458, in addition to a pay of from $162 to $324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government buildings, paying a rent equal to one-half of the additional pay above mentioned.

PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres (out of which 862,236 were unproductive area), there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land

has been sold actually at prices ranging between $5 and $340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit, after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the diminished area is partly explained by mistakes made formerly in the survey of the forests.

DUCHY OF BADEN.

STATE FORESTS.

The aggregate extent of the state forests of Baden is 248,000 acres, located in the Black Forest, the upper val-

ley of the Rhine and in the Odenwald. The prevailing kind of trees is the spruce. Reforesting is effected by seed from standing trees; also by planting trees; in some rare cases by artificial sowing, the latter in the case of Scotch pine. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the forest law of Baden of the year 1833, no part of any forest is allowed to be kept uncultivated.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Forests and Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councillors of the Forest Board, and have a salary not exceeding $1,380, and $147 for expenses.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

PRIVATE FORESTS.

About one-third of all private forests is managed on forestry principles. The total forest product of the country increases gradually.

BAVARIA.

STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its state forests comprise 2,150,000 acres, and are mostly managed as "selection" forests. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers, red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is $50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to $4,965,204. The total revenue from the forests the same year amounted to $8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforesting is mainly done in the natural way. In the case of the fir (*pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly

crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforesting is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only $974, in 1894 only $1,686. The principal cause of such fires is the carelessness of the workingmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councilor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would, of course, also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

FORESTRY IN BULGARIA.

Bulgaria, bordering the west coast of the Black Sea and the south bank of the Danube, was in antiquity a part of Thrace. That, in the drama of "The Gladiator," was the native land of Spartacus. Now a slave and gladiator, he had, he says, in boyhood looked from the "cloud-piercing Hoemus" upon a fertile country sloping to the mighty Danube, where "peace was tinkling on the shepherd's bell and singing with the reapers."

Bulgaria, with a population now of over four million, was for five centuries a province of Turkey, but gained its political independence thirty years ago. It has made rapid progress in recent years, and naturally forestry is one of the things that has received favorable attention from its enlightened government.

The total area of the forest in Bulgaria comprises 7,512,000 acres, being 30 per cent of the whole area of the country. Of these, 2,231,000 acres belong to the State, 3,866,000 acres to parishes, 132,000 acres to schools and 1,283,500 acres to private individuals. Scotch pine and other conifers, including fir (*picea pectinata*) and spruce, are the prevailing kinds of trees.

ADMINISTRATION.

The administration of the forests is by a bureau in the Ministry of Commerce and Agriculture, and consists of a chief, an inspector general of forests and two assistant chiefs. The budget for forests and forestry for the year 1905 was $150,000. There are six district inspectors, who have received scientific forestry training, 40 foresters who have received forestry training. There is a district inspector for each 1,250,000 acres and a forester for every 190,000 acres. There is a keeper to patrol the forest to every 3,500 acres. There are also many other employes. For the parish forests there is a forester for every 125,000 acres.

These facts are taken from an unusually able and fine volume entitled "Bulgaria of To-day," issued in 1907 by the Bulgarian Ministry of Commerce and Agriculture, and a copy of which was kindly sent to the Commissioner of Forestry of Minnesota by the British Diplomatic Agent and Consul General at Sofia, Sir G. W. Buchanan. The following are the concluding words of the chapter on forests in said volume:

"The improvement of our forests demands enormous sacrifices, but on the other hand a time will come when the revenue from the forests will play an important part in the State budget. The Bulgarian Government, fully aware of its duties and its interests, concentrates its efforts to this end; to make our forests, by the simplest means, in the near future a source of riches, which are so sorely needed by the young State for the completion of its organization."

It is an interesting fact that Bulgaria, in territorial extent, is only half as large as Minnesota.

DENMARK.

STATE FORESTS.

The Danish state possesses forest areas as follows: Real state forests, 141,000 acres, of which 100,600 acres are grown with trees; parks, 2,840 acres, of which 1,520 acres are grown with trees; the forests of Sorö Academy, 8,580 acres, of which 6,650 acres are grown with trees; and sandy downs plantations, 53,500 acres.

In the following information the downs plantations are not included; so the production area used as a basis of the information is accordingly 109,770 acres.

The surface of the country consists of diluvial formations with exception of the island of Bornholm, where the granite rock in many places reaches the surface. On the islands and in the eastern part of Jutland the soil consists of more or less fertile clay, sand, gravel and stones mixed together. Fertility is in most cases dependent on the quantity of clay. In the midland and western part of Jutland there are amongst the higher lying hilly parts larger, flat, meagre sand fields, heaths, overgrown with heather. They were formed in the glacial period by the masses of sand carried down by the rivers of melting water. Along the western coast of Jutland there are considerable stretches of sandy downs.

Of the above-mentioned area, 37.6 per cent are covered by beech, 3.6 per cent by oak, 5.9 per cent by ash, maple, birch, elm and alder, and 52.9 per cent by coniferous trees, especially spruce (*picea excelsa*). The planting on the Jutland heaths is almost exclusively effected with spruce and mountain pine (*pinus Montana*). If these plantation areas are deducted from the above-mentioned grown area, we find the productive area of the real forests to be about 90,000 acres, of which beech occupies 44 per cent, oak 4 per cent, ash, etc., 7 per cent, and coniferous trees 45 per cent.

The average annual cutting is about 215,000 cubic meters. Forest pine (*pinus silvestris*) is very slightly grown. It is generally cut in the 75th to 90th year and has then at a height of 0.3 meter above the ground, a diameter of 25 to 30 centimeters. The mountain pine (*pinus Montana*) is cut at an age of 40 to 45 years, and has then, at a height of 1.3 meter above the ground, a diameter of 8 to 10 centimeters. The spruce (*picea excelsa*) is cut at the age of 60 to 75 years, and has then, at a height of 1.3 meter above the ground, a diameter of 25 to 30 centimeters. The silver fir (*abies pectinata*) is cut at an age of 75 to 80 years, and has then a diameter of 30 to 35 centimeters. Tops and branches are laid aside in piles where it is possible to sell them as fuel. This is done everywhere where the forests are scattered. In the larger forests the thin branches (under 3 centimeters) are cut off and remain lying on the ground or are gathered and burnt, whereas the thicker parts are shortened to a length of one meter and sold as fuel. The state never sells timber standing; it is always cut down.

The administration of the state forests is under the Department of Agriculture; its yearly budget is voted under the general budget of finances and its officers are appointed by the king. The total annual expenditure (1906-1909) was 1,201,465 Kr. (333,740 Dollars). This does not include expenses for the instruction of forest officials or for experi ments, as these expenses are paid conjointly by the state and the private forests. For a long series of years no new areas of land have been purchased, but the annual expenses for planting heath areas, formerly purchased, have been included in the above amount of expenditure.

The total annual gross revenue (1906-1909) was 1,718,088 Kr. (477,247 Dollars). The fact that the net surplus is comparatively small is to a great extent due to the fact that a considerable amount is spent on young plants on the heath areas of the state and the areas cultivated in this manner give no profit for a long series of years.

The greater part of the state forests have belonged to the state from time immemorial, so it is only in a smaller part of the forests in which capital has been invested by purchase.

The way of cutting depends upon what kind of tree is to be used for reforestation. If this is beech (*fagus silvatica*) or silver fir, the old cultivation is thinned by degrees, and the last trees are taken away 8 or 10 years after the first thinning. If spruce or oak (*quercus pedunculata* and *sessiliflora*, at times *rubra* and *coccinea*) is to be reforested, the area is cut clean in parts.

Beech is often, silver fir occasionally, reforested by natural seeding after cultivation of the ground; but generally both species of tree are reforested by planting; sometimes they are sown in rows, dug or hacked up. Oak is almost always sown in such rows. On the sowing of oak on fields for the establishment of a new forest the cultivation of the soil is completed, and it is then sown with seeds and acorns. Spruce and mountain pine are almost always planted.

About 1,500 acres are planted annually. The plants are generally 4 years old when they are planted. They are, as a rule, planted at a distance of 2 x 4, 3 x 4 or 4 x 4 from each other. Thirty to forty men will presumably be able to do the plantation work on one acre—taken as an average—at 75 to 110 Kr. per acre ($20.75 to $30.00).

Forest fires are rare, and they occur almost exclusively in the heath plantations in Jutland. Here at certain intervals, parallel with each other and vertical to each other, 9 meter broad rows, the so-called fire-lines have been placed, which are kept free of vegetation by ploughing. Alongside the railway similar fire-lines are found on stretches where there is a danger of fire.

The number of persons who are occupied in the state forests is very variable, according to the time of the year. The year round only 350 men are employed, but in the winter season, from November to May, this number may increase to 800 to 900 men, of whom, however, a good many are replaced in the planting time by women and larger children. The workmen employed all the year round have about 250 working days annually. Nearly all the workmen who have permanent employment live in houses which belong to the state forests; the remainder of persons occupied live in the neighborhood of the forests.

A scientifically educated forester (Skovrider) has on the average 6,000 acres under his supervision. The Skovriders receive a salary of 2,600 Kr., increasing to 3,800 Kr., free residence and about 30 to 80 acres of free service land. Some of them receive 400 to 1,000 Kr. for traveling expenses. They are entitled to receive a pension from the date of their appointment according to the same scale as all other Danish state officials, viz.: Years of service, per cent of average salary for the last 5 years.

From 0 to 2 years.... 1/10%
From 2 to 4 years.... 2/10%
From 4 to 7 years.... 3/10%
From 7 to 10 years.... 4/10%
From 10 to 20 years.... 5/10%
From 20 to 21 years....31/60%
From 21 to 22 years....32/60%
From 22 to 23 years....33/60%
Etc., etc.
From 28 to 29 years....39/60%
Over 29 years..........40/60%

The scientific forest officers are: Two forest-masters who rank in the third class, but hold a higher rank, being court officials in addition. Their salary is 5,800 Kr., increasing to 6,600 Kr.; 23 Skovriders who rank in the fourth class and whose salary is mentioned above; one forest-valuer who ranks with a Skovrider and receives pay of 3,200 Kr., increasing to 4,000 Kr.; and 10 forest assistants who receive 1,400 Kr., increasing to 1,800 Kr. annually.

About the year 1700, but not before 1763, regular forestry, according to a fixed scheme, was introduced.

The higher forest officials for State or private forestry are educated in the Royal Agricultural Academy. The time of studying is six years, and the average number of forest students is about 40. The lower forest officials (foresters), of which there are about 90 in the hereinbefore-mentioned parts of the state forests, are not educated in special schools, but are instructed practically, as well as theoretically, in the districts during three years, subsequent to which they pass an examination before a State Commission.

Since 1904 working plans for the state forests are made for periods of 15 years. The division of the districts is revised, and the various parts are now only made of a size of 4 to 40 acres. The experimental department is not any more superintended by a forest-valuer, or forest-appraiser, but by an experimental chief, who is assisted by a commission. "Tidsskrift for Skovväsen" (Forest Review) is issued by Professor C. V. Prytz and forest assistant Fr. Brammer. "Det danske Hedeselskab" (The Danish heath Cultivation Society) has now its seat in Viborg (formerly in Aarhus). The state subvention for this society is now about 325,000 Kr. ($90,140) annually. Under the supervision of the Society (up until 1907) the area taken in for planting of trees is about 158,000 acres, of which about 65 per cent had been prepared for cultivation. The company itself owned at that time about 15,100 acres of plantation.

Scientific observations as to the influence of forest upon climate or upon rainfall have been made and are continuously being made, but hitherto no results have been obtained which could in any respect increase or alter old known experience.

PRIVATE FORESTS.

According to Statistical Reports of 1909, the area of the private forests, including forests belonging to local bodies, was 599,761 acres.

About 75 per cent of this area is managed or supervised by scientifically educated foresters. Of the said area 16,751 acres belong to local bodies, 176,933 acres are entailed property.

The system of taxation of private forests and of the products of private forests is the same as the system of taxation of other productive landed property (agricultural land for example). The forests are assessed for tax to the state according to their trade value, to the local bodies according to the annual net profit.

Private persons are prohibited by the law of September 27, 1805, from cutting away those remnants of the old forests of the country still existing in the said year. In cases of offense, means are placed in the hands of the government to force the owners to restock the cleared area under control of the state officer in charge. Consequently, but very few forest areas have disappeared in the course of the nineteenth century.

FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,600,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,800,000 acres; forests of the municipalities and of the

Kitchen of a logging camp in Northern Minnesota.

United States agency for the Chippewa Indians at Leech Lake, Cass County, Minnesota.

public institutions, 4,800,000 acres; forests of individuals, 16,000,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the cork oak (*quercus suber*), the evergreen oak (*quercus ilex*), the cluster pine (*pinus pinaster*) and the Aleppo pine (*pinus halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European oak (*quercus robur*), the European white oak (*quercus pedunculata*), the beech (*fagus silvatica*), the hornbeam (*carpinus betulus*), the common European ash (*fraxinus excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the silver fir (*abies pectinata*), the Norway spruce fir (*abies excelsa*), the beech (*fagus silvatica*), the Scotch pine (*pinus sylvestris*), the mountain pine (*pinus montana*), the larch (*larix Europea*).

STATE FORESTS.

The total area of the forests of the state, 2,800,000 acres, is composed of 2,200,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet)	38,100,000
Fire wood (cubic feet)	64,200,000
Total	102,300,000

This represents nearly an annual production of 46½ cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is $6,000,000, or $2.72 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as $8 per acre.

The expenses are as follows, viz:

Personnel	$1,240,000
Forest instruction	36,000
Sundry works	336,000
Reforesting of mountains	651,000
Taxes paid to departments and municipalities	405,000
Sundry expenses	57,000
Total	$2,725,000

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforesting mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed $1,500,000 or 70 cents per acre. The net annual income of these forests is therefore $2.72 less 70 cents, equal to $2.02 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations approved by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood

they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforesting from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying, and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintainance of forest roads, water sawmills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforesting has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is $10.00 per acre.

The State and Communal forests are organized and managed so as to obtain regeneration by means of natural seeding. A sufficient number of trees are left standing that they may entirely cover the ground with their seed.

It may happen that those trees are thrown down by a hurricane or destroyed by fire. In that case recourse must necessarily be taken to planting, but that case does not often occur. In the private forests the same method is generally applied as in the State and Communal forests. However, as these forests are felled at a very early age, the proprietors must restore them by planting. This only occurs in the regions of plains where pine forests are grown on barren ground with a view of yielding the largest possible revenue.

A forester, with scientific knowledge, *i. e.*, a ranger or assistant conservator (*Garde general ou Inspecteur adjoint*—these two officers fulfilling the same functions) has on an average to administer an area of 19,000 acres of State forests, Communal forest or forests belonging to a public establishment. They generally have at their command three chief guards and ten or twelve forest guards.

Properly speaking, there are no workmen who devote themselves especially to forest work. Most of them only come into the forests in the bad season; in summer time they work in the fields. The number of workmen employed for 1,000 acres can therefore not be given exactly. It varies according to the regions and the longer or shorter time that the workmen devote to the forest work. Many forests being surrounded with villages, many woodcutters repair to their homes every evening. However, when the forests are very large and require work too far situated from the villages, the workmen, in order to avoid too great a loss of time in the morning and evening, construct huts in which they spend the night and cook their meals. The charcoal-burners, obliged to watch day and night over the kilns, always live in the forests.

Very considerable reforesting is made on mountain lands, where the State plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose $700,000 are expended every year, the largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The State purchases yearly, on an average, 16,000 acres. The average cost of reforesting is $20 per acre, and $18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 2 conservators, 3 administering general inspectors, 12 inspectors, 7 assistant inspectors and 19 clerks.

An exterior service composed of:

First—Personnel, superior or of administration—32 conservators, 200 inspectors, 210 assistant inspectors, 232 general wardens.

Second—Personnel, inferior or of surveillance—3,650 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director	**$3,000**
Administrators	**$1,800 to 2,600**
Conservators	**1,600 to 2,400**
Inspectors	**800 to 1,200**
Assistant Inspectors	**600 to 800**
General Wardens	**300 to 520**

Exclusive of some additional allowances for traveling expenses.

INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of ..	**$160.00**
Foremen and wardens paid by the municipal corporations and public institutions	**116.00**

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,800,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,600,000 acres. They produce annually, timber, 45,000,000 cubic feet; fire wood, 125,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 37 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is $6,500,000, or $1.41 gross income per acre. The net income is about $1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the president of the republic. These regulations and those of the state

forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve, and oftentimes leave none at all. One can notice, however, that the principles of sylviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of

drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of $4 to $20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, and telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Al-

geria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of $600,000.

GRAND DUCHY OF HESSE.

STATE FORESTS.

The productive forest area in 1908 amounted to 182,263 acres. The timber stands on nearly level land, 80 to 100 meters or on hillsides that rise to an elevation of about 800 meters above sea level. From a geological standpoint the soil of these forests varies considerably. Some being alluvial and diluvial sands, colored sandstone, granite, basalt, slate, quartz, etc.

The prevailing kinds of trees vary according to the mineral and physical nature of the land, as well as the climatic conditions of the locality. In general the standing timber is composed of 69 per cent hardwood and 31 per cent coniferous forest; 47 per cent of the hardwood being red beech. The fir ranks first among the coniferous species. In suitable localities or for the purpose of filling in here and there, are found oak, ash, maple, white beech, birch, alder, aspen, linden, locust, pine, fir, larch, white pine, weeping fir, Douglas pine, Sitka pine, etc.

The total yield of lumber and timber in 1908 was 129,606 cubic meters (4,575,091.8 cubic feet). Of this, 36,876 cu. m. (1,301,722.8 cu. ft.) was from hardwood trees and 92,730 cu. m. (3,273,369.0 cu. ft.) was from coniferous trees. The average cutting age in general was, for oak, 140 to 160 years; for red beech, 100 to 120 years; for fir, 100 to 120 years, and for pine 80 years.

Refuse, in so far as it is not suitable for lighter lumber such as laths or for pulp, is used for firewood, as is also the refuse from hardwood trees.

Standing timber is not sold to be cut by the buyer himself. The cutting is always done by the administration. Most of the lumber, also sills and mining timber, as well as pulpwood, is submitted to competitive bidders before cutting. The former (i. e. lumber, sills and mining timber) is sold per cubic meter and the latter per rough meter (i. e. as cord-wood is sold) and only after being awarded to the highest bidder is cut by the forest administration. The valuable milling timber and a part of the lumber is sold at public auction.

In 1909 the expenditures for salaries and for forest protection amounted to 630,336 marks ($150,019.97). Expenditures for wages, 1,773,738 m. ($422,149.64). The latter include cutters' wages, 1,047,059 m. ($249,200.04). Expenses of forest cultivation, 416,647 m. ($99,161.89). Expenses of road building, 237,567 m. ($56,540.94). Insurance of laborers, 72,465 m. ($17,246.67).

Expenses for forestry instruction and the purchase of additional lands are not included among the above named items.

The total gross income (from lumber and firewood) in 1908 was 4,882.066 m. ($1,161,931,708).

The capital represented by the forests, 22,128,000 m. ($52,665,354, figured at $714 per 2,471 acres), brought interest accordingly at 2.21 per cent.

For coniferous forest clear cutting is the rule. For hardwood trees, both methods are practiced about in the ratio of one to one.

The reforestation of cut-over lands is entirely through artificial planting or sowing.

For coniferous forests, planting is the rule, sowing the exception.

The former is used on 95 per cent of the cultivated areas, the latter on 5 per cent.

For hardwood (foliage) trees, the ratio of planting to sowing is about 75 per cent to 25 per cent. On the average about 700 ha. (1,729.7 acres) are annually planted. Fir trees are planted as one year old plants, 25 centimeters (9.84 in.) between each plant. On cultivated strips which are 1 m. (39.37 in.) apart.

Coniferous trees are planted as 3 to 4 years old nursery plants in holes 1¼ m. (49.2 in.) apart, three plants forming vertices of a triangle whose sides are 1¼ m. For the planting of one ha. (2,471 acres) of forest land in one day the following is required:

For cultivating the soil about 30 men with wages at 3 m. ($714)—$21.42.

For setting out the plants about 33 women with wages at 1.50 m. ($0.35)—$11.78. Total for wages, $33.20. To this must be added the cost of the plants, which is about 90.5 m. ($21.54). Total cost per ha. (2,471 acres), $54.74.

For reforestation by seed: Preparation of soil, about 55 men, 165 m. ($39.27.) Sowing of the seed, about 35 women, 52.5 m. ($12.49). Total for wages, 217.5 m. ($51.76). Cost of seed, 72.5 m. ($17.25). Total cost, 290 m. ($69.02). In case the nature of the soil permits, the use of the lately constructed forest plows noticeably lessens the cost of soil preparation.

The number of forest fires and damage resulting therefrom is generally inconsiderable. The total number of forest fires in 1908, with an area of 245,578 ha. (606,823 acres of state, communal and private forests) was 53. The total damage was $678.30 (2,850 m.) The means taken for the preventing of forest fires, in addition to a regular established corps of forest-protection officers, are, the establishment of a system of roads and lanes; the permanent establishment of fire protective stretches along railroads running through the forests; bordering a coniferous forest along a railroad with hardwood trees. A fire having broken out, which can not be extinguished by the available forest employes, requisition is made upon the fire brigades, respectively the inhabitants of the neighboring villages, to perform the necessary cutting or eventually to dig trenches for the localization of the fire.

In the state forests about 3,700 persons are annually employed on 150 working days in the year. All employes live in villages near the forests which (villages) are seldom more than 5 kilometers (3⅛ miles) distant.

The district under the supervision of a scientifically educated forester (Oberfoerster) comprises 1,960 ha. (4,843.16 acres) in the state and communal forests. The salary on entering the service is 2,800 m. ($666.40), and increases every three years until it reaches the maximum amount, which is 6,000 m. ($1,428) per year. This sum is attained after 21 years of service. Besides this salary the officer receives his official residence at a reasonable rent. In case no residence owned by the administration is in the district, a rental fee of 360 m. to 480 m. ($85.68 to $114.24), varying according to the locality, is annually allowed. For the keeping of a horse, 1,100 m. ($261.80) is annually allowed. When a horse is not kept, the necessary livery expense is paid. For other traveling expenses (on business) which takes the officer more than 2½ kilo. (1¾ miles) from his district and takes up more than 5 hours of his time, a daily allowance up to a total of 400 m. ($95.20 per year is granted. For stationery, stable-room and fuel, 500 m. ($119.00) yearly is paid. For the routine correspondence, a regular secretary is furnished him by the state. The pensioning of officers takes place in case the officer, on account of sickness or old age, cannot attend to the work. The pension salary varies according to the number of years of service, 50 to 100 per cent of the salary when last in active service. In case of death, the survivors (widow and minors) receive a fixed sum varying according to the number of years of service of the deceased.

The highest forestry board is the Ministry of Finance for Forestry and Domains ("Ministerium der Finanzen Abteilung fur Forst und Kameralverwalting"), which is composed of a Ministerial Councillor ("Ministerialrat"), who is chairman; of five supervisor Forestry Councillors ("Oberforestraten") and one lawyer.

The annual salary of the Ministerial Councillor is 7,500 to 9,500 m. ($1,785 to $2,261), according to number of years of service. Members of the Superior Council receive 5,800 to 7,200 m. ($1,380.04 to $1,713.60), according to the number of years of service. The Ministerial Councillor receives a rental fee of 760 m. ($180.88). The Superior Councillors, a similar fee of 576 m. ($1,370.88). For services rendered away from home, transportation is paid and a daily allowance of 9 m. ($2.142) for a day of over 6 hours, also 3 m. ($7.14) for hotel expenses.

After having served a number of years, the Ministerial Councillor advances to Privy Councillor, the Superior Forestry Councillors to Privy Superior Councillors, and the Superior Forester ("Oberfoerster") to "Forstmeister."

The scientific education of officers in the forestry service is obtained at Gieszen. The number of students from Hesse was, on the average, about 20 in the last year. The forest rangers' school at Darmstadt prepares young people for the common forestry service, and is, on an average, attended by 50 students, who later find employment in the state-communal and private forestry service.

For about 25 years weather bureaus have been established. However, the results concerning the influence on forest upon climate and rainfall have not yet been sufficiently determined.

PRIVATE FORESTS.

The area of private forests is 7,7033 ha. (190,348.54 acres). Private forests class 1, 53,556 ha. (132,336.87 acres). Private forests class 11, 23,477 ha. (580,116.67 acres). All first-class private forests are managed on scientific forestry principles by an educated forestry officer. These forests are all the hereditary possessions of families.

TAXATION OF PRIVATE FORESTS.

The value of the land is fixed for the purpose of taxation according to the prevailing local prices; value of this land being naturally much less than that used for agricultural purposes. The value of the land is arrived at by scientific principles, with reference to the stand and yield.

There is state supervision in private forests of first class.

This supervision consists only in preventing the reduction of large forest areas (over 2½ ha.—6.17 acres) without the consent of the Superior Forestry Board. This permission is not required if at the same time or at some time previous an equal area of land has been planted.

As far as forests of the second class are concerned, the management of these is left entirely to the owner, with this proviso, that he make use of the forests in accordance with regulations; for example, that he do no cutting which would be considered *forest devastation.*

A total deforestation can only be undertaken with the consent of the Superior Forestry Board. Within three years, cut-over land must be prepared for reforestation; if not, the work is done by the Forestry Board at the expense of the owner. The high esteem in which the forests are held and the importance of preservation is generally appreciated by the common people. The inhabitants of larger cities, especially prize the orderly care of the forests.

The immaterial, ethical worth of the forest is being recognized more and more, and in reality represents an invaluable asset to the larger cities as resorts for air-cure and bathing.

HUNGARY.

I.—STATE FORESTS.

Total area of forest land 3,606,006 acres, of which 2,176,351 acres are under systematic management. Of the prevailing kinds of trees twenty-two per cent are oak, forty-six per cent beech and hornbeam, fourteen per cent spruce (*abies excelsa*), four per cent silver fir, and only two per cent pine.

The average age at which coniferous trees can be felled is from 80 to 120 years, at which time they have a diameter of one and a quarter feet, measured three and three-quarters feet from the ground. After timber is felled and removed the refuse is used for fuel, except that twigs and tops of coniferous trees are left in the woods.

Fifty-eight per cent of the forests are situated six hundred meters above sea level, twenty-eight per cent between two hundred and six hundred meters, and four per cent under two hundred meters above sea level.

The number of acres cut in 1909 was 26,091.

Heretofore the timber was sold standing at auction according to measurement, but now the state has adopted the practice of doing the cutting itself and selling the products. The annual expense of management and protection (not including forestry instruction) is 15,387,000 crowns (1 crown equals 19 cents); net annual income 8,204,730 crowns. The forest capital, including improvements, is valued at 210,090,000 crowns; the net rate of income therefore is 3.9 per cent.

The compartment system is chiefly practiced; partly with clear cutting and planting the cleared area; partly securing natural regeneration by leaving seed trees. In 1909 there was reforested by natural seeding 590 acres, by sowing 9,270 acres, by planting 30,611 acres. Total acres reforested in one year, 40,471. Generally the plants are two or three years old, their distance apart one meter, so that about 4,019 plants are used per acre. Average cost of planting per acre 24 crowns; of sowing 6.80 crowns per acre. On an average, the setting out of 1,000 plants takes from 1.5 to 7.0 of a man's daily work. A day's work of a woman is calculated as three-fourths of a man's work; of a child as half.

It is very seldom that damage is caused by forest fire. By the forestry law of 1879, chapter 31, section 12, the authorities can order out the inhabitants to extinguish fire, and in some cases the neighboring inhabitants are obliged to help, without pay. Section 100 of the same law imposes a fine of from four to forty crowns upon anyone who, without permission of the owner or of the forest authorities, sets fire within 100 meters of forest or fails to extinguish it; or who, having noticed a forest fire, neglects to report it to the nearest inhabitants or fails in his duty of putting it out. If great damage is caused by the fire he will be liable to severer prosecution and punishment.

There are now employed in the management of the state forests 495 forest engineers, with university degree, 87 clerks, 8 chancery clerks, 9 physicians, 1,397 forest rangers (with lower forest school degree), 7 man servants, 6 midwives, 140 keepers, 126 women (keepers), and hired workmen according to circumstances. A forester (forest engineer or forest surveyor) manages on an average 5,000 to 7,500 acres of forest land.

Following is the present rate of compensation in the forest service:

		Salary	Lodging money	Allowance for fuel and land
5th Class,	Councillors of the Ministry	12,000 Cr.	2,500 Cr.	1,387 Cr.
		10,000 "		
6th Class,	Chief Commissioners of Woods and Forests	8,000 Cr.		
		7,200 "	2,000 Cr.	1,170 Cr.
		6,400 "		
7th Class,	Commissioners of Woods and Forests	6,000 Cr.		
		5,400 "	1,600 Cr.	992 Cr.
		4,800 "		
8th Class,	Forest Engineer, 1st Class	4,400 Cr.		
		4,000 "	1,300 Cr.	835 Cr.
		3,600 "		
9th Class,	Forest Engineer, 2nd Class	3,200 Cr.		
		2,900 "	1,000 Cr.	673 Cr.
		2,600 "		
10th Class,	Forest Assistant or Forest Engineer, 3rd Class	2,400 Cr.		
		2,200 "	900 Cr.	563 Cr.
		2,000 "		

The salary is raised in the classes 5-8 every 5, in the classes 9-10 every 4 years. The above allowance for fuel and land and lodgings especially is that for Budapest; in the country it is less.

The main part of the state forests has been cultivated and systematically managed for centuries. Systematic management was ordered by the forestry law of 1879 (chapter 31) for all state forests and common-woods.

According to paragraph 36 of the above mentioned Act, foresters must get their education at the high school for forestry engineering in Selmeczbànya (4 years; after final examination at a gymnasium).

The number of undergraduated varies between 200 and 250. There exist four lower schools for forest keepers, namely: Vadászerdö, Királyhalma, Görgényszentimre and Liptóujvár. The total number of the students is limited to 180.

There are five scientific experiment stations.

II.—FORESTS NOT BELONGING TO THE STATE.

Total area, 18,665.989 acres; systematically managed, 19,969.321 acres. According to paragraph 17 of the Forestry Act, the following owners are obliged by law to manage their forests systematically, namely: towns, commons, churches, foundations, common possessions, entailed estates, associations.

Taxes are: land-tax and income-tax. The land-tax for the forests is lower than the tax for the farming lands.

The forests of towns, commons, churchlands, foundations, common possessions, entailed estates, associations, are in every case to be maintained as such, and if the possessors cannot employ an extra manager (graduated forester) they are obliged to give it into state management (Forestry Act concerning the woods and forests in state management, 1898, chapter 19, paragraph 1).

The forest inspectors have to inspect the woods and forests.

The direction of the state forests is managed by eighteen forestry directions of the state with their corresponding district offices (managed by a forest engineer).

The management of the forests of the commons, etc. (managed by the state) includes 43 district offices with their subordinate offices.

All forestry functionaries are subordinate to the Royal Hungarian Ministry of Agriculture.

ITALY.

STATE FORESTS.

The Demesne Forests, administered directly by the state, extend over a surface of 147,259 acres, of which the forests properly termed productive, 121,086 acres, are thus divided: Trees of full growth, 79,081 acres; trees large enough to cut, 42,005 acres. The principal species of trees in said forests are, considering them in declining order: Trees of high growth, oaks, beeches, firs, pines, larches and chestnut trees. Trees of less growth but fit to cut, oaks, beeches and chestnuts.

The districts according to their nature represent the greater part of the geological formations from the most ancient to the most recent.

The sale of timber is made with the trees standing, and is ordinarily by public auction as is prescribed in the law of the state relating to general accountability.

The average annual expense of administration amounts to 363,712 Lire. That was the computation for the seven-year period, 1892-1899, and, however, does not include that which is attributable to the five forests declared inalienable after that period of time and which extend over a surface of about 17,290 acres. No part of this expense relates to forestry instruction or to the purchase of new lands. Throughout the entire septennial period above mentioned the net revenue amounted to an annual average of 273,441 Lire.

The capitalized value of the forests is not known so far as to give the basis for ability to calculate the percentage of their annual net returns. Such return may be inferred, however, by reference to the entire forest area of about 103,788 acres, as it was prior to the aforesaid period and, therefore, brings the result of 2.63 Lire per acre.

The reforesting in all cases is made by seeding or artificial planting, except among the trees of lesser growth fit to cut, where it happens naturally by reason of reproduction from the stumps. On an average, provision is made for the reforesting of fifty acres of bare territory during each year in the forests of the state. In proceeding to set out trees we use those from nurseries or those grown from seed and of from one to three years' growth, and they are set out ordinarily in couples and in little depressions two meters apart; a task which requires 2,023 small plants and the labor of about forty men, entailing an expense of 80 Lire per acre.

In the forests of the state the fires of any importance are those which happen in the island of Sardinia, where the damage often reaches a great sum, but which, being extremely variable and of intermittent occurrence, is not reducible to any average amount. The principal preventive measures adopted to fight the fires are guard-patrols and the construction of a network of lanes. For extinguishing such fires, provision is made for facing against the wind where it is possible and suppressing the flames by beating them down with fresh boughs. The flames proceed from the underbrush, which is the principal source of propagation for such fires. Often, recourse is had to "cesse" (improvised lanes) and, in exceptional cases, to counter-fires.

The state forests are all under the direction of persons equipped with proper technical education. The forestry officials commence with a stipend of 2,000 Lire, which is the salary of an Adjunct Sub-Inspector of Forests, and, ultimately, a compensation of 8,000 Lire, which is the salary of a Superior Inspector of the first class. The Sub-Inspectors have an allowance for travel of 250 Lire, and the Inspectors have an allowance of 400 Lire per annum. Persons employed in the forest service have the right to a pension after twenty-five years of service. The minimum pension is the half and the maximum four-fifths of the annual salary.

The highest functionary in the forest service is the Superior Inspector of the first class, with an annual salary of 8,000 Lire. The next in order are three Superior Inspectors of the second class, with a salary of 7,000 Lire, and two with a salary of 6,000 Lire. Scientific service in the forests of the State was introduced in the year 1869 with the founding of the Forestry Institute of Vallombrosa.

For scientific instruction in forestry there was created, in the year 1869 (inaugurated August 15th of said year), the

As late as the year 1909, young licenciates of the technical institutes and of the lyceums were admitted without examination, and those not provided with such license were admitted upon examination. But of these there were only ten who, at the end of the course, were licensed and nominated as Adjunct Sub-Inspectors of Forestry. Moreover, in the current year 1910, an identical course of rapid instruction has been instituted, and in the scholastic year just completed there are, also, actually ten purses of study granted. In Cittaducale was instituted by Royal Decree, twenty-fifth day of May, 1905, No. 250, a School of Silviculture for the forestry guards, the scope of which is to provide for the theoretical and practical instruction of the forestry guards of the various provinces of the Kingdom and of such persons as may aspire to similar employment. This school is attended by about twenty-five pupils. The course of instruction is completed in one year. It begins the first day of October and terminates on the thirty-first day of July.

From and after the year 1910, one of the two licenses will be required for admission to the course; for that of the superior institute physico-mathematical or land surveying, a previous examination upon the following topics: Mathematics, Physics, Chemistry and Natural History.

The course is one of four years, at the end of which the pupils are nominated Adjunct Sub-Inspectors of Forests with a salary of 2,000 Lire. The Minister of Agriculture, Industry and Commerce, at the end of the course, confers upon each licenciate the professional diploma of Forestry Expert. The institute admits into its course, also, foreigners who desire to acquire knowledge of the forest-flora of Italy. Upon an average there are thirty pupils that attend the course of instruction; that is, in the four classes taken altogether.

In 1909, in order to provide in the shortest space of time for completing with qualified persons the statutory roster of forestry officials, enlarged by virtue of the law of July 5, 1908, No. 375, a course of eight months for graduates in agricultural science and in engineering was instituted. In consequence, about twenty graduates in the agricultural course and one engineer were entered for the course.

NORWAY.

STATE FORESTS.

The extent of the public and semi-public forests, according to the latest returns, cover an area of 546,932 hektars of coniferous trees and 369,967 hektars of foliferous trees (almost exclusively birch), making together 916,899 hektars, estimated at a total value of Kr. 34,720,837, no consideration having been taken to rights of use (usufruct) connected with the forests. The average value of the woodland makes thus about Kr. 37,86 pr. hektar.

The total expenditure in connection with the management and administration of the forests for the financial year 1904–1905 amounted to Kr. 644,700,53, while the revenue yielded by the forests during the same period was Kr. 1,109,147,85.

Of the above expenditure, however, about Kr. 190,000 were paid as grants to private forestry, purchase of woods and other objects, which do not concern the direct management of the public forests.

During the year 1904, 1,529,245 trees were planted out (chiefly pine, *pinus sylvestris*, and spruce, *abies excelsa,*) with which has been covered an area of about 3,058 hektars and 41,30 kilograms of seed have been sown over an area of 21 hektars at a total cost of Kr. 28,883,61.

During the same year ditches have been dug in bogs and sour (seepy) ground and brooks cleared in a length of 91,142 running meters.

The regeneration is effected chiefly by natural seeding from the remaining trees and the mode of felling the trees is mainly on the basis of the selective cutting system.

The staff of the office for woods and forests consists of 1 Skogdirektor (director of forests), 4 Skoginspektorer (inspectors of forests), 26 Skogforvaltere (managers of forests), 1 Skogtaxator (valuer of forests), 4 Skogassistenter (forest assistants), 13 Skogplantere (forest planters) and 418 Skogvogtere (forest keepers). With exception of the forest keepers the whole of the staff is made up of men more or less thoroughly trained for this special line. On each of the "Skogforvalters" to whom the management of the public forests is entrusted, falls on an average 31,415 hektar. The distribution of the area is, however, very uneven.

There are no permanent laborers in connection with the forest and woods office of the State. Provided the trees from the public forests are not sold standing on the root, the felling and the conveyance (transport) of the wood is contracted for, while the planting and sowing, as well as the work in the nurseries, are carried out at daily wages, which as a rule are not higher than the earnings of ordinary day laborers (viz., about Kr. 3.00 a day). Where the forests are situated far away from inhabited places, cabins have been erected for the use of the laborers, and cottages for the staff.

The state has four great and several smaller nurseries, and for the drying of tree seeds two large and four smaller establishments which supply the necessary seed for public use and are also able to set apart a great portion for private consumption, especially of spruce seed.

In accordance with Section 3 of the Act of Storthing of July 20, 1893, rules and regulations for the protection of the forests have up to now been adopted in 77 districts,

and in accordance with Section 8 of said Act ordinary forest regulations in 37 districts, together 114 districts.

The majority of these regulations aim at prohibiting the cutting of trees under certain dimensions, still with the modification that cutting of trees not holding the proper measure is allowed in most cases where they have been selected by the overseer, who is paid by the district in question. The said Act of the Storthing is not considered to allow binding regulations for replanting and sowing of destroyed forests to be included in the above regulations.

In accordance with the Act of Storthing of July 14, 1893, with supplementary Act of July 27, 1896, regulations for the prevention and extinguishment of forest fire have hitherto been adopted in 164 districts. The regulations provide for compulsory attendance of able bodied men in case of forest fire. It has been found that these regulations have greatly contributed to limit the spreading of forest fires.

The State has a High School and two elementary schools which give instructions in forestry. Such instruction is also given by several agricultural schools.

PRIVATE FORESTS.

A society has been formed called ''Det norske Skogselskab" (the Norwegian forest society) comprising the whole country with branches in 15 Amter (counties). The society has 18 nurseries and supports about 50 private nurseries. Two establishments for the drying of seeds are in operation. During the year 1904 the forest societies planted out about six million plants and sowed 415 kil. seed by which an area of about 1800 hektar of bare ground is considered to have been cultivated. During the same year ditches have been dug in bogs or in sour (seepy) ground and brooks cleared in a

total length of about 259,000 meters or 259 kilometers.

"The Norwegian Forest Society" publishes a journal for forestry, of which 5,400 copies have been printed and is published monthly. In addition thereto a review "Forstligt Tidsskrift" is published by two graduates in forestry for their own account, and which is published in quarterly issues.

In order to assist private people in the management of their forests, 11 Amtskogmestere (district inspectors of forests) have been appointed, whose salary and traveling expenses are defrayed, one-half by the state, whereas the other half is paid by the county in question.

PRUSSIA.

STATE FORESTS.

The extent of the state forests of Prussia is 7,403,022 acres. Included in this, however, are 790,345 acres not designed for tree culture. In addition, the extent of forests belonging to the Crown is 178,879 acres; belonging to municipalities, is 2,726,012 acres; belonging to churches, 241,990 acres; belonging to corporations, 583,979 acres; private forests, 10,376,956 acres, making an aggregate extent of 21,510,838 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to $700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1898 to 1908 per annum, $12,712,920. The annual aggregate revenue in the years 1898 to 1908 amounted to $24,952,182, being at the net rate of $1.85 per acre of actual forest. The average number of acres sown or planted with forest annually

during the years 1898 to 1908 was 50,684. The number of acres newly planted in 1908 was 53,954. The age of the plants is from one to five years. They are planted in plots from 1.2 meters to 2 meters square, and at a cost of from 40 to 80 marks an acre.

The area of evergreen forests annually reforested from self-sown seeds is extremely small in comparison with the sections which are replanted either by seeds or seedlings. In the case of Scotch pine (*Pinus sylvestris*) and spruce, artificial regeneration by seeds or seedlings forms the rule. Natural regeneration prevails in the case of the silver fir (*Abies pectinata*) and the beech, though with both species artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. In regard to the continuity of forest products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875, the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1897 to 1909 was as follows: Totally or mostly destroyed, 1,503 acres; only slightly damaged, 80 acres; only the surface destroyed, 689 acres. The average annual number of forest fires in the years 1897 to 1909 was 22, the causes of which were as follows: 11 unknown, 2 railroads, 2 incendiary, 6 caused by carelessness, 1 lightning. During the years 1897 to 1909 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The

foresters have clerical rank. The salary of "Oberfoerster" (district manager) ranges, according to length of service, from 3,000 to 7,200 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 300 marks annually. In addition, there is usually free residence and fuel, and allowance for contingent expenses not exceeding 3,900 marks. The salary of the "Oberfoerstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberfoerstmeister" is allowed an amount not exceeding 4,000 marks for traveling expenses, the "Forstrath" an amount not exceeding 3,000 marks. The "Oberfoerstmeister" receives furthermore 1,200 marks additional compensation for administrative supervisory services. One-third of the number of the councillors ('Forstrath") receive 600 marks each additional in consideration of the location of their official posts. The "Oberfoerstmeister" and the councillors also receive an amount not exceeding 1,200 marks for residence.

The Prussian Chief Forester, with a salary of from 14,000 to 17,000 marks, with 2,000 marks for residence ("Oberlandfoerstmeister"), and five State Chief Foresters ('Landfoerstmeister") with a salary of from 7,000 to 11,500 marks and 1,600 marks for residence, are at the head of the state forestry administration.

The right to a pension matures for all officers upon the expiration of the 10th year of service. The pension is at the rate of one-third the salary, increasing in time to three-fourths the salary.

The average size of state forests placed in charge of a scientifically trained forester amounts to 9,830 acres. Within the entire state forests, during the year 1908, there were employed 173,597 workmen (and workwomen) working on 10,448,440 work-days. In other words, there have been employed, per 1,000 acres of state forests, 23 workmen (and workwomen) engaged on 141 work-days.

The workmen obtain a sufficient wage scale. In order to attach the workmen and their interests to the forest, a number of small farms are being leased to them at a cheap price. Within the entire state forest administration of Prussia, there are kept, altogether, 870 houses for forest workmen, containing 1,819 dwellings.

There are two Forestry Academies, designed for instruction for students preparing for the forest administration service. These academies are at Eberswalde and Münden, Hannover. There were 79 students at both institutions during the summer term, 1909, and 97 students during the winter term, 1909-10. These students all taking courses of instruction with a view to entering the Prussian Forestry Service. Besides these there were 121 guests, or special students, during the summer term, 1909, and 134 such during the winter term 1909-10.

There are four Forestry Schools, preparing for the forest protection service; the aggregate attendance from October 1, 1907, to October 1, 1908, was 195.

Observations as to the influence of forest upon climate and rainfall are still in progress.

PRIVATE FORESTS.

The area of the private forests of Prussia, as above stated, is 10,376,956 acres.

About 50 per cent of the private forests are managed on forestry principles. This proportion does not relate at all to hereditary estates.

In eastern Prussia level country with sandy or clayish sandy soil prevails; in western Prussia the country is mostly mountainous.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of $1.85 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

RUSSIA.

STATE FORESTS.

At my request the then American ambassador at St. Petersburg, Mr. Riddle, kindly furnished me information on forestry in Russia. It is probably not generally known in this country that scientific forestry was introduced in Russia as early as 1820; and that a school for scientific instruction in forestry is maintained at St. Petersburg attended by 565 students. For the support of this school the Russian government expends annually $93,250.50, and the students $17,643.50. Besides, there are in the empire 32 lower grade schools for forestry instruction with 580 students. The state forests comprise the enormous

area of 634,143,918 acres, the merchantable timber on which is sold under sealed bids. The expense of administration averages about $5,570,773 annually. The revenue in 1904 amounted to $24,650,278. Selection cutting is mostly practiced. In 1905, 21,241 acres were artificially planted and 126,052 acres started for replanting. The forests at present are under the charge of 1,237 scientifically trained foresters.

The following are the questions I submitted and the answers that were furnished:

Question 1.—Area of the productive state forests of Russia, character of surface and soil and prevailing kind of trees? Area:—

Siberia	102,600,000	acres.
Caucasus	19,353,918	"
Russia in Europe	461,700,000	"
Finland	50,490,000	"

Soil:—Generally sandy-clay.
Species:—Pine, fir, oak and birch.

Question 2.—Average number of feet of timber annually cut therefrom; average age of pine when cut and diameter breast high at such age?

No accurate reply can be made to the first part of this question, as the acreage of all the forest land in the empire (especially in Russia in Asia) is unknown; there is likewise no information relative to the mass of trees cut each year on private forest estates, the acreage of which in Russia in Europe amounts to 108,000,000 acres. In view of this only the amount of timber obtained from state forests can be given. The Report for 1905 shows that out of 286,427,665 acres of state forests in Russia in Europe 4,802,412 cubic fathoms (7 feet) of timber were cut from 229,532,232 acres; about 22 percent of this amount was received from the forests of Northern Russia, namely, the provinces of Archangel, Vologda, Perm Olonets and Viatka, covering an area of 247,702,139 acres, which in 1905 yielded 1,062,304 cubic fathoms of timber. Furthermore, in the Caucasus, 13,418,327 acres of state forests, with good forest land covering 8,454,607 acres, yielded 132,463 cubic fathoms of timber, and in Russia in Asia 361,945,497 acres of forests belonging to the state, of which 129,169,881 acres are good forest land, yielded 607,595 cubic fathoms of timber. Thus all the state forests in the empire, covering 661,792,491 acres, yielded in 1905, 5,542,470 cubic fathoms of timber.

With regard to the average age of pine when cut, this can only be approximately defined, according to the manner in which the forests are cleared, namely: whether the whole forest is cut down or whether only chosen trees are cut.

Generally in Russia in Europe the age of the trees felled is: for pine, from 80, 100, 120 and 150 years; for oak, 60, 80, 100, 120 and 150 years; for fir, 60, 80 and 100 years. For private forest landowners the forestry laws are applied, and the age for oak is 40 years; while that of other leaf trees is fixed at 30 years. The forests mortgaged in the Nobility Land Bank enforce in European Russia, in the North, the age of 100 years; in Central Russia, 80 years; in Southern Russia, 70 years; for oak 120 to 80 years, when bad growth, 40 years; for birch, poplar and alder, from 30, 40 to 50 years. In the state forests the age for cutting is fixed: for oak, from 80 to 120 years, and for other species, from 40 to 60 years.

With regard to the diameter of trees cut, an average cannot be properly given, as it varies so greatly, in view of the age, degree of intensity of the growth, local requirements, etc. In properly managed estates, the trees cut have dimensions from 13⁄4 to 17½ and 26¼ inches. In

Northern Russia the diameter of coniferous trees, the pine and fir tree, sent to the market at Archangel and obtained from the provinces of Archangel and Vologda, varies from 14 inches to 15¾ inches breast high, while trees of 21 inches and even 26¼ inches in diameter are found. The average diameter of oak trees is also difficult to establish, but it may be fixed at 15¾ to 21 inches, while gigantic oaks are found having from 43¾ to 52½ inches in diameter breast high.

Question 3.—Explain briefly the way in which the state sells its standing timber?

Notwithstanding the growing importance which the exploitation of forests has taken in Russia it rarely occurs that the proprietors manage their own estates; the forests are generally divided into small lots and sold to the highest bidder. The sale of forests belonging to the Domains and the Imperial Cabinet are generally advertised for sale, six months in advance. The bidders present their offers in sealed envelopes which are opened on a day fixed for this purpose in their presence. They may make bids for a number of lots or for the whole forest, depositing from 10 to 20 per cent of the contract value as guarantee for the proper execution of the contract.

The party who has made the highest bid receives the permit to cut the trees, and, if he deposits the entire value of the contract, he receives the permit to carry away the timber. The trees are cut down for the most part in Russia from October 28th to March 28th. Hand labor is abundant in the north of Russia, where forestry constitutes the main resource of existence of the population, as well as in the central and western provinces, where the peasants have no other winter labor. Labor is paid by tree or beam or rafter, or by the fathom for wood to be used as fuel. The average day costs from 45 to 50 copeks

(22½ to 25 cents) per laborer in the basin of the Vistula, while it becomes less, being 20 cents per day in the eastern provinces, and runs up as high as 35 and 45 cents per day in unpopulated districts. Generally the laborers form themselves into an "Artel" or association having a "starosta" or "senior" at the head, which directs the work and acts as intermediary between the agents and laborers.

Question 4.—What is the annual expense of administering the state forests, and does such expense include forestry instruction and the purchase of additional lands?

The expense of administering the state forests including expenses of forestry instruction amounted in 1904, and is about an average, to $5,570,773.

Question 5.—Amount of annual revenue?

The revenues from the state forests in 1904 amounted to $24,650,278.

Question 6.—Is clear cutting or selection cutting mostly practiced?

In state forests selection cutting is mostly practiced.

Question 7.—About what proportion of cut over land becomes reforested by natural seeding and what by artificial planting or sowing?

The report of state forests for 1905 shows that the state, when it sells its forests to private parties for exploitation, receives from the purchaser a pecuniary guarantee for the proper and full exploitation of the contract. And these sums when not returned to the contractors on account of improper fulfilment of their contract, form a fund used in reforesting or planting forests. Thus in 1905 from the sums thus obtained and from credits obtained for that purpose: (a) 21,241 acres were artificially planted; (b) 7,290 acres of planting were finished; (c) 126,052 acres were started for replanting; (d) 105,799 acres were worked at, and (e) 38,383 acres already planted received supple-

mentary work. In forest lands belonging to private owners in Russia in Europe out of 39,906 acres 32 per cent were replanted and 68 per cent sown.

Question 8.—How many acres are annually planted?

The answer to this question was included in No. 7.

Question 9.—What is generally the age of the plants; how many feet apart are they planted; how many men, women or children does it take to plant an acre per day and at what expense?

The age of the plants which are transferred from the nursery devoted specially to the cultivation of various kinds of trees, is as follows: the pine, generally from one to two years of age; the fir, 2 to 3 years old; the oak, from 2 to 3 years old; other leaf trees from 1 to 2 years old.

The method of planting pine and fir trees in Russia is in squares, the trees being planted in rows, the rows and trees being 42 inches apart. The forests are also planted in rows 56 inches apart, the trees therein being 28 inches apart. In the first instance 9600 young trees are planted on 2.7 acres, and in the second instance 2.7 acres contain 10,800 trees. Oak and other leaf trees are planted in rows 56 inches apart, the trees being 28 inches apart.

The cost of this work depends upon many conditions: the quality of the soil, the degree of readiness of the soil, the distance of the nurseries from the ground to be planted, therefore it is preferable to give several instances which characterize the amount of labor required. These instances have been chosen from reforesting effected in the province of Voronege (Central Russia).

1.—The planting of pine trees in sandy and sub-sandy prepared soil, 1 to 2 year trees in rows 56 inches apart and 28 inches distance between trees, placing one or two trees in each hole, transported over a distance of from ⅔

to 5⅓ miles; including the digging of the holes, the force employed per deciatine (2.7 acres) was: for laborers with horses 0.35 to 0.40; for laborers without horses from 3.5 to 3.6, and for women from 2.5 to 2.9.

2.—The planting of pine, same soil as above, in furrows ploughed out 42 inches apart, digging up the young trees and transporting them over a distance of from ⅓ to 2 miles; digging holes with spades in furrows and planting the trees, the force expended per deciatine (2.7 acres) was: for laborers with horses 0.65 to 0.90 and for common laborers without horses 2.9 to 5.9 and women from 8.6 to 15.2.

3.—Planting 1 to 2 year old oak trees at the rate of 1200 per deciatine (2.7 acres) in firm soil (black clay), one or two trees in each hole dug out by spade, each hole being 6 vershoks (10½ inches) deep, the force expended was: men with horses from 0.12, men without horses from 1.3 to 4.5 and women from 12.5 to 13.8.

4.—The planting of 1 to 2 year old oak, 400 to the deciatine (2.7 acres), cost force per deciatine: laborers with horses 2.9, without horses 8.8 to 12.0 and women 5.8 to 6.2.

The planting of trees in the black soil steppes of Southern Russia, at the rate of 10,800 trees from 1 to 3 years old per deciatine (2.7 acres), requires about 1 man with a horse, 10 men without horses and 12 women.

With regard to the cost of the above named work, it varies greatly according to the price of labor in the different localities. In the province of Voronege the cost of labor is from 50 to 75 cents per day for a man with a horse; 20 cents for men without horses and from 15 to 20 cents for women.

Question 10.—Annual amount of damage by forest fires? Means taken for preventing and extinguishment of forest fires?

In 1904 the amount of damages in the forests by fire and other reasons, was as follows:

Loss caused by fire	$84,930.50
Loss caused by insects	24,068.50
Loss caused by floods	1,039.50
Loss caused by snow storms	10,098.50
Loss caused by wind	33,147.00
Loss caused by other reasons	6,566.00
Total loss	$159,852.00

The means taken for preventing and extinguishment of forest fires is not stated.

Question 11.—Number of persons annually employed in the state forests and average number of days in a year; and about what number of them reside in or near the forests?

In reply to the first portion of this question it is necessary to state that nearly all the lumber obtained from the state forests is used either for the requirement of the peasant population or is sold by auction, so that both the peasants and contractors work the forests with their own laborers; on this account the Forestry Department does not employ laborers for the state forests, and when it does employ laborers it is for timber required for its own use (valued of about 2½ million dollars per annum), as well as for reforesting purposes.

The second portion of the question is so indefinite that it is difficult to give a reply. If this question is made in order to ascertain the relation between the forest area and population in various parts of the empire we then refer to the information on this subject contained in the copy of the "Forests of Russia," edited for the Universal Paris Exhibition in 1900. (This book has been forwarded.)

Questions 12 and 13.—On an average how many acres are under the supervision of a scientifically educated for-

ester? What is his pay and allowance? After how many years service does he receive a pension and at what rate? Also: What is the title, rank and pay of the highest class of forest officials?

If the first portion of this question refers to the average number of state foresters employed in Russia, the reply is included in the Forestry Report for 1905, namely: 1237 foresters, of which 996 in Russia in Europe, 87 in the Caucasus and 154 in Russia in Asia. The area of the forests under their control would be as follows: In the north of Russia in Europe, the average area of forestry would vary from 2,970,000 acres in the province of Archangel to 245,592 acres in the province of Viatka, while in the Caucasus the area is, for instance, 147,420 acres, and in Russia in Asia 2,430,000 acres.

Foresters are divided into two categories (I. Class and II. Class). Forest Inspectors into "Seniors" and "Juniors". The duties of the latter are to inspect and control from 2 to 4 foresters in their district. At present the majority of crown foresters have acquired the highest forestry instruction, and the average number, lower instruction. Inspectors have assistants which have obtained the highest degrees in forestry. In 1905 there were 253 assistants and 1386 forest "conductors" or guides.

The pay of local foresters serving the crown varies according to the condition of their duties and may be expressed as given below:

Senior forest inspectors				$1250.00
Junior forest inspectors				1075.00
Foresters I class	from	$725	to	875.00
Foresters II class	from	600	to	750.00
Assistant foresters	from	275	to	400.00
Forest guides	from	200	to	350.00

These amounts include from $75.00 to $250.00 for expenses of displacement.

With regard to pensions it must be said that they have to serve 35 years, but a portion of the pension is granted to persons who have served less time, according to categories: up to 15 years, from 15 to 25 years and from 25 to 35 years.

The amount of pension they receive is worked out as follows: ¼ of their pay when they have served 15 years; ⅓ when they have served from 15 to 25 years, ½ for 25 to 35 years' service, and ⅔ of their annual pay for 35 or more years' service.

The rates of pensions for 35 years' or more service, are fixed as follows:

Senior forest inspectors	$600.00
Junior forest inspectors	500.00
Foresters of I class	400.00
Foresters of II class	350.00
Assistant foresters	200.00
Forest guides	125.00

It must be remarked that according to the laws in force foresters (as well as inspectors) and their assistants have the special privilege of receiving land, the proportion being from 81 to 121½ acres for foresters and inspectors and 40½ acres for forest assistants. Besides, many foresters, inspectors and their assistants receive dwellings in houses belonging to the Government and purposely built for them; those who do not receive free dwellings are made a special allowance therefor. Fuel is granted to all in proper quantities.

Question 14.—When was forestry first introduced into the management of state forests?

In 1820.

Question 15.—What are the colleges or schools for scientific forestry instruction and aggregate number of students attending; also, number of forestry schools of lower grade and number of students attending?

There is, so far, only one college for scientific forestry instruction, which is known as the "Institut du Corps Forestier" in St. Petersburg, which had last year 515 students on January 1st, this number was increased during the year by 169 more; 64 students graduated and 55 left for various reasons, thus on January 1, 1907, there were 565 students as follows: 181 in the I class, 154 in the II class, 127 in the III class and 103 in the IV class. The whole course lasts four years. The maintenance of this college costs annually $110,894, of which sum the government pays $93,250.50 and the students $17,643.50.

Besides, there are 32 lower grade schools in both Russia in Europe and Russia in Asia, with 580 students. At the beginning of the present year 1162 students presented themselves but only 255 were accepted. The maintenance of these schools costs the government $78,827.00.

GRAND DUCHY OF SAXE-MEININGEN.

STATE FORESTS.

The area productive of woody growth is 110,900 acres. The state forests are situated in a mountain range called the "Thüringer Wald" and in a hill country abutting on it where the underlying rock is red sandstone of the trias, shell limestone and keuper-limestone. The prevailing species of forest trees are: Spruce (*Picea excelsa*), pine (*Pinus sylvestris*), fir (*Abies pectinata*), beech and white oak.

In 1908, the yield (cut) of the state forests was 33,800,000 feet board measure, or 4,765,000 cubic feet.

The rotation for pine is from 100 to 140 years (averaging 110 years); at that age, the diameter of the trees 4½ feet above the ground is 12 to 16 inches (average 13 inches). The rotation for spruce is 90 to 110 years (averaging 105 years); at that age, the diameter of the trees, measured as above, varies from 12 to 15 inches.

The smaller branches and the tops of the conifers are used for fuel; the pine needles are used for litter in the stables.

The Department does not sell any standing timber. The trees marked by the forester are cut into logs or worked into cordwood at the expense of the state and are sold from the woods by public auction to the highest bidder.

Is it the avowed policy of all German states to buy for the state neglected farms, abandoned fields, maltreated forests, unproductive, swampy stretches, or sand barrens, with a view to returning such land to productiveness by forestry. Waste land owned by towns the government foresters try to have restored to tree growth.

Clear cutting as well as shelter wood-compartment cutting is in vogue. About three-fifths of the second growth is being obtained by planting, and the remaining two-fifths are supplied by natural seeding. In 1908, there were planted in seedlings (after clear cutting), 957 acres. The age of the plants used for planting is: In case of spruce, 2 to 4 years; pine, 1 to 3 years; fir, 3 to 5 years. The planting distance is, for spruce and fir, 4 feet 4 inches square up to 5 feet square; for pine, 3 feet 4 inches square. Usually the plantations are made under contract, at an outlay averaging $12.50 per acre.

The damage inflicted upon the forests by forest fires is small; it can not be estimated to average more than $125 per annum. Preventive measures are: Raising of mixed stands; proper supervision by watchmen; rules prohibiting the smoking of pipes, cigars or cigarettes in the woods; fire lanes, kept free from vegetation. Remedial measures are: Isolation of a burning woodlot from the woodlots adjoining by ditches or strips raked clean; beating the flames with a brush-switch.

In 1908, 1,004 individuals were employed, residing in the villages close to the forests.

All state forests are placed in charge of foresters of scientific training. Their salaries are: For "Superior foresters" (supervisors), $600 to $1,050 per annum, plus $75 to $150, paid toward living expenses. For rangers (inferior staff), $300 to $600. The highest officials in forestry perform the functions of counselors in the Department of State. Their salary is from $1,000 to $1,750.

The foresters receive their scientific training outside this state, at universities and forest schools belonging to other and larger states of the empire. There exists a ranger school (for the inferior staff) in this state. To it three new students are admitted annually.

PRIVATE FORESTS.

The majority of the forests privately owned consists of small and very small parcels. There is a relatively small number of family forests (entailed). The woodlots privately owned are found partly scattered and partly in compact bodies.

The total area of the private forests in this state is 63,250 acres. About 10,750 acres are forming parts of estates of larger size. The management of these forests does not always correspond with the tenets of strictly conservative forestry.

The taxation is based, on forest land as well as on farm land, on the estimated net acre-yield obtained in an average year.

The consent of the Secretary of State is required for the subdivision of woodlands as well as for their change into farms. The owners of woodland are held to reforest, after clean cutting, within a space of time fixed by law.

The supervision of private forestry is left with the state government acting through the Superior foresters and through the so called "Superintendents of Private Forests." Statistical records are kept at headquarters showing the acreage of woodland privately owned.

Aside from state forests and of private forests, there are situated in this state 88,425 acres of woodland belonging to towns, religious institutions and corporations, and 2,367 acres of woodland belonging to other states (e. g., Prussia, Saxe-Weimar, etc.)

As regards the town forests and those owned by institutions and corporations, the following remarks are pertinent:

The cut was, in 1908, 10,800,000 feet, board measure (1,517,500 cubic feet). No standing trees (stumpage) are sold in these woods. The trees are either felled, cut into logs or cordwood, and then sold by public auction or directly to interested parties; or else the trees are felled by the citizens (villagers) enjoying a prescriptive right or an easement over the forest. In the latter case, the persons entitled obtain the wood either free of charge or against a fixed price per unit.

The average net revenue per acre is $4.69, ranging between 56 cents and $6.68 per acre for the various districts.

The reforestation of cutover land is, by natural seeding, two-tenths; by artificial regeneration, eight-tenths; these proportions are estimated.

In 1908, 772 acres were planted in seedlings, and 86 acres planted in seeds. The planting distance is: For spruce and fir, from 4 feet by 4 feet up to 6 feet by 6 feet for pine, from 32 inches by 32 inches up to 40 inches by 40 inches; also 48 inches by 20 inches. The average expense is $22.21 per acre.

The 27 managers of these forests are men of technical and scientific education; there are, however, also some former rangers who have risen from the ranks to the position of manager. The salaries are varying.

The state government is about to offer a bill pertaining to a systematic change of the mode of employment for foresters in charge of town forests, institution forests and corporation forests.

The rangers and the forest guards are recruited from all sorts of professions. For most of them, the duties of a guard are a side issue.

The highest official connected with these forests is the same man mentioned as the highest authority for state forests.

SAXONY.

STATE FORESTS.

The aggregate area of the state forest is 448,900 acres, of which 18,200 acres are in farms, grass meadows, etc. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,637.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 235,000 acres. The second group, in the outskirts of the Erz mountains and in some smaller distinct mountain ranges, comprises 113,000 acres· and the third group, in the plains, comprises 94,000 acres. The soil consists of decomposed granite, granulite, gneis; mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus sylvestris* (L.); silver fir, *abies pectinata* (D. C.); larch, *larixeuropæa* (D. C.); rotbuche, *fagus silvatica*

Clear cutting in a German forest. Crew rolling a big spruce fir 31 inches in diameter, breast high, and 108 feet tall. Instead of a cant hook the men use a stout pole run through a ring to which a hook is attached.

The center of the picture shows a worn out pasture which many years ago was covered with valuable pine timber and which would have yielded a good revenue if the forest had been renewed.

(L.); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L.), *a. platanoides* (L.); further, several species of elm, *ulmus;* of birch, *betula;* and of linden, *tilia.* The prevailing species is spruce, comprising 80 per cent.

The yield (cut) of the state forests in the year 1908 (wood and timber of over 3 feet diameter) was, in feet board measure, 226 million, or, expressed in cords, 361,500 cords, or, expressed in cubic feet, 31,910,000 cubic feet. In this total are comprised 83 per cent of wood and timber fit for technical use, and 17 per cent of firewood.

The age of final maturity, beyond which the trees are not allowed to remain, is; For spruce (*picea excelsa*), 80 years; for pine (*pinus sylvestris*), 80 years; for all hardwoods, 120 years.

The diameter of the trees measured with the bark at 4½ feet from the ground at these ages depends entirely on the quality of the soil; it varies, for spruce, between 8 inches and 10 inches; for pine, between 6 inches and 10 inches.

The yield of tops and branches under 3 inches diameter was, in the year 1908, all together, 230,000 cords, of which 27,700 cords were used by the industries, the balance of 202,300 cords being sold for fuel.

Public sale of logs and of wood (cut at the expense of the Department) at auction to the highest bidder forms the rule.

The entire gross expense for forestry in 1908 was $1,554,400. In this is included the outlay incurred for the Working Plan Division. The above aggregate is composed of: $622,900 for salaries, etc., $282,000 for planting, road building and other improvements, $649,500 for logging (also workman's insurance, forest experiments, etc.)

The summary given ($1,554,400) does not include the outlay for purchase of additional forest lands, nor does it comprise the expense incurred for forest education.

The entire gross revenue from forestry in 1908 was $3,942,400. The net revenue was, as a consequence, $2,388,000, equal to $5.32 net per acre; and equal to $6.65 net per cord (stumpage), or equal to $10.13 net per 1,000 feet board measure (stumpage).

The investment in forestry forms a grand total of $94,040,000. The rate of net interest derived from it is $2½ per cent

The clear and clean cutting of mature stands forms the rule. The gradual removal of a stand by selection cuttings is exceptional and rare, being applied almost exclusively to beechwoods.

The regeneration of a stand from self-sown seed is practiced only on very small areas, in the case of stands of mature beech. The area annually reforested after cutting varies, according to the requirements and according to the areas bared from trees acquired by purchase from private owners. On the average, the area annually replanted in a systematic way comprises 5,750 acres. In 1908 there were reforested 182 acres by seeds planted, 5,747 acres by seedlings planted; total, 5,929 acres. The average age of the seedlings used for reforestation is, in the case of pine, 1 year; in the case of spruce, 2 to 5 years.

The expense per acre, reforested (including all nursery work, etc.), averaged, in 1908, $14.60. The work is not done by contract; it is done by day work, the wages of laborers per ten-hour day being, in planting work, for men, 70 cents; for women, 40 cents; for children, 25 cents.

Forest fires are relatively rare and not extensive. In 1908, seventy fires were reported, destroying 18½ acres of plantation, at an estimated total loss of only $550. The expense incurred for extinguishing the fires was $182 only. The majority of the fires are due to carelessness of visitors (throwing away matches or cigars) and to locomotive sparks. The latter danger the Department seeks to avert by establishing safety strips along the lines of the railroads.

The Forest Department gives employment to 15,000 individuals, working, in the aggregate, on 1,344,800 work days. 4,600 workmen, more or less continuously employed on 1,048,700 work days, notably in logging and other heavy labor, are "staff-workmen;" the balance of the individuals are given temporary employment during the planting season, or at roadwork of an unusually large character. All of the forest workers reside in villages in the immediate proximity of the forests in which they are employed.

The area placed in charge of a state forester (supervisor), trained practically as well as scientifically, averages about 4,000 acres. The state forest is subdivided into 109 such districts, each of which is independently administered by a state forester who is called "Superior Forester," and who draws an annual salary varying from $900 to $1,800. The position allows of an additional $500 per annum for traveling expenses (including horse keep) and office expenses, and of an additional $75 toward house rents. Prior to 1908, the officer was provided with a house free of charge. Since that year, he pays from 10 per cent to 12 per cent of his salary by way of house rent. The pension right of a state forester begins after 10 years, reckoned from his first employment. The pension comprises from 30 per cent to 80 per cent of his salary, the amount depending on the duration of past employment. The highest figure (80 per cent of salary) is allowed after 40 years of active service.

The 109 forest districts mentioned are allotted to nine "inspections," each of which is headed by a "Superior Forest Master," whose annual salary varies from $1,650 to $2,325, plus traveling expenses of $825, and plus allowance toward house rent of about $75 per annum. Prior to 1908, the officer was entitled to the use of a house free of charge; since 1908, he pays from 12 to 18 per cent of his salary for house rent. The nine inspectors report to the Secretary of Finance. One member of the Secretary's Council is a forester bearing the title, "State Forest Master."

The beginning of a systematic and regular management of the state forests in Saxony coincides with the beginning of the 19th century. From the middle of the 16th century on, however, the state authorities have progressively prevented (by so-called "forest ordinances" and by a forest police staff) the absolute devastation of the woodlands, establishing certain rules tending to secure, in the long run, some sort of forest management.

The state foresters (alias "Supervisors" or Superior Foresters") receive a scientific training, after a year's course at a university, at the technical school of forestry at Tharandt, Saxony. During the summer months 48 Germans and 45 foreigners were studying at Tharandt.

The forest rangers (guards) obtain a merely practical training during three years of apprentice work under a "Superior Forester." There do not exist in Saxony any "forest ranger schools."

The goal of forestry in the state forests of the Kingdom is this: "The highest net dividend must be obtained from every acre of forest soil; or (which is the same), the highest possible rate of revenue must be obtained from every dollar invested in forestry."

This demand for the application of purely "business methods," or financial methods, in state forestry was first made in 1858 by Professor Max Pressler, one of the teachers at the State Forest School at Tharandt. Since 1867, his teachings have been introduced into the practice of forestry, with the result that the "rotations" have been shortened, and that stress has been laid on the reproduction of softwoods in preference to hardwoods.

PRIVATE FORESTS.

The aggregate area of private and municipal forests in Saxony in 1900 was 520,000 acres, and these are the latest statistics of their area.

The forests of larger size, and notably those owned by towns, by religious or charitable institutions or by families (under entail) are usually well managed, according to the tenets of modern forestry. The forests of small size privately owned (farm woodlots) are irregularly managed, without system or rule.

The reasons for this deficiency are simply these: Forestry of a conservative type cannot be practiced successfully unless the forests are fairly large and compact. The owner of a small woodlot is a relatively poor man, usually; he is unable to make any investments tending to increase the productive capacity of his holdings only in the long run, and without yielding immediate returns by way of dividends or reimbursements.

TAXATION OF PRIVATE FORESTS.

Private forests are taxed in the same manner in which private farms are taxed. In both cases, taxes are levied according to the actual net revenue obtained per acre during the last three years.

Private forests proper are free from any state-governmental supervision or interference. The town forests, however, are subject (like all other property of the towns) to the general supervision of the general public administrative officers (id est, they are in no way supervised by the forestry department; they are supervised by the state department, in a general way).

GRAND DUCHY OF SAXE-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres; in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working Plans," at Eisenach, the director of the forest academy being at the same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property; maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintainance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

SPAIN.

For the answers herewith I am indebted to Hon. Henry C. Ide, American Minister to Spain.

STATE FORESTS.

The forest area considered available for public purposes in Spain is as follows: Belonging to the state, 243,229 hectares, to municipalities 4,672,029, and to public institutions 6,542;

total, 4,921,800 hectares, or 12,161,767 acres. In all of the foregoing reservations the state forestry service has supervision and they are subject to forestry regulations. According to methods of improvement, they are classified as: high mountains, 2,154,584 hec., low mountains, 1,248,951 (the first called in French Futaic and second Raillis), and 3* mountains covered with bushes and herbaceous plants, 1,518,265 hectares.

The different kinds of trees covering the first two named mountains are: Pine, 7 species, fir (*abies pectinata*), beech, oak (5 species of oak), ash, maple, birch and alder. These mountains ,as well as those covered only with a growth of bushes and herbaceous plants, are found mainly among the higher ranges of the Pyrennees, Cantabrian Pyrennees, Iberian and Guadarrama mountains, Gredos and Gata, the Sierra Morena, Sierra Nevada, mountains of Toledo, the more arid portions of La Mancha and the sandy plains and bleak wastes of the high central tablelands of the Peninsula. The soil is completely denuded in the large level tracts and bare spots not protected by trees which disappeared due to irregular exploitation in former times.

Each year the average cut is about 160,254 cubic meters of wood, equivalent to 5,723,359 cubic feet, English. Pine is cut ordinarily at 100 years, having at that age an average diameter of 45 centimeters. Hemlock (*abies excelsa*) is not found in large tracts in Spain. The cuttings of the trees (tops and branches) are used for fuel.

Both in the forests belonging to the state and those belonging to municipalities the amount of wood to be cut is fixed annually according to reports furnished by the Inspector for each district and approved by the Minister of Fomento. Once this approval is obtained the engineers in the different districts proceed to mark the trees with the official seal and gauging the same. If the number of trees is considerable and they are situated at different spots far apart, they are divided into lots and bids asked for separately according to the corresponding administrative and technical conditions. In the cutting, the transportation, etc., the engineers are in direct and continuous charge, to prevent abuses and excesses.

The total annual cost of the forestry service for the past decade, including the expense of technical personnel and rangers, instruction in forestry and replanting of higher river valleys and acquisition of private lands, has been 4,892,681 pesetas, or $944,287 (a peseta equals one franc, or $0.193).

The amount of annual receipts in the last decade has been 9,032,618 pesetas, from all sources. This is a low figure which is not explainable except on the ground of the desolate condition of the forests in Spain which make necessary a large amount of reclamation work. The yield per hectare is 1.54 pesetas. In the forests which are under scientific care, and which are those in the best condition, this yield per hectare is 7.34 pesetas. Calculating the capital represented by all of the public forests of Spain, the annual yield is 1.83%.

In the forests containing tall trees the cutting is done by selection or by reproduction through successive clearings. In the lesser growths the timber is many times entirely cut off as the new growth is assured from the sprouts on the stumps.

In all of the forests the cut areas are replanted almost entirely by natural seeding.

Artificial replanting, as also the work of controlling the streams and fixing seacoast dunes, are entrusted to the following branches of the Forestry Hydrologic Service: 1. Lower Cuenca, Ebro and Eastern Pyrennees; 2, id., Jaen; 3, id., Seguro; 4, id., Tajo; 5, id., Guadalquiver and other rivers of of the district of Malaga; 6, Middle Cuenca, Ebro; 7, Upper Cuenca, Ebro and (8) Guadarrama; 9, Canaries.

Since the year 1910, in which they were created, the plans for reforesting, restraining streams and placing dunes embrace about 124,988 hectares, and the work completed 12,614 hectares. The disproportion between the work done and the work contemplated is due to lack of funds available for the hydrologic and forestry service.

The age of the plants upon transplanting is generally from one to two years in the coniferous, in those of the plain leaved varieties two years and in some kinds of oaks four years. In each hectare there are set out from six to eight thousand plants and usually in groups of two each. To plant one hectare per day, from 30 to 35 men are needed. The wages of the workmen range from 1.75 pesetas (Murcia) to 2.50 pesetas (Cataluna); women receive 1.50 pesetas and children 1.25.

The annual loss by fires is placed at an average of 253,000 pesetas. The means employed to prevent them are the opening of fire cuttings among the heaviest of the coniferous growths and along the railway lines. To extinguish them promptly once started a flying brigade is formed during the summer among the operators and a system of rapid communication established by means of signals.

As the work on the state forests is done almost wholly by contract, the forestry service has no data available as to the number of persons employed in the state forests.

At present each ranger has to look out for about 4,000 hectares, but in view of the impossibility of properly taking care of such a large tract, the government plans to increase the ranger service sufficiently to properly care for this work.

The rangers are of three categories: Guarda mayor, or head guard, receiving 3.50 pesetas per day; sobreguarda or second guard, receiving 3 pesetas per day, and peon-guarda or laborer guard, receiving 2.25 pesetas per day. Whatever their length of service, they have no right to a pension. The highest rank in the corps of foresters (Cuerpo de Inginieros de Montes) is that of Inspector General, ranking as a bureau chief of the first class, with an annual salary of 10,000 pesetas.

The principles of forestry culture were introduced in the service in Spain in 1855.

The only school for instruction in scientific forestry is at the Escorial, where aspirants for the title of Forester (Inginiero de Montes) are given instruction. The number of students is about 50.

No systematic observations of a scientific nature have as yet been made in Spain with reference to the forests as a factor in the climate and rainfall.

PRIVATE FORESTS.

The forestry service has not yet intervened in the exploitation of private forests, and is therefore unable to state the acreage of the same.

The larger portion of the private forests are not subject to scientific treatment, exception made of a very few, transmitted in inheritance and belonging to the great houses of the nobility.

There is no especial tax on private forests, the same tax being applied to them as to farm properties.

The law of June 24, 1908, provides that private forests situated within the protected forest belt (zona protectora dasocratico) must conform in their exploitation to a forestry system formed by the Forestry Service for each forest for the purpose of securing the preservation of the trees. In case the owner does not agree to this plan the state shall proceed to the expropriation of the forest in behalf of the public utility.

SWEDEN.

STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is $4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was $185,397, and the aggregate revenue was $1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about $10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägmästare," with annual salary of $1,707 and rank corresponding to the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of $1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of $160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of $2,400, and having rank corresponding to that of a major-general in the army; and a chief of bureau, with salary of $1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about $5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote re-growth of private forests.

FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000 acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area, not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive surface of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

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*Information furnished in Swedish by Dr. Fredrik Loven, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Rämen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The

Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500 feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harfjellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a "fjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each, and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one or two cows and several smaller animals are fed. About 14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years, which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural seeding. The cuttings are not so large but what the bystanding trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy and and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than 100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to $0.85).

The income from game is not large. There are shot annually 12 elks, many hares and game birds.

SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. In conformity with the prescriptions of the federal law of October 11, 1904, all forests of Switzerland are placed under the supervision of the Confederation.

The Confederation itself is not actually the owner of any forests, but some of the separate states are owners. The forest domains are part of the national wealth, and comprise 96,497 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,414,677 acres. Besides there are private forests comprising 604,014 acres. The total area of forests is therefore 2,115,188 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in the high mountains. Forests are found standing at 200 meters above the sea level (in the canton of Tenin) and reach as high as 2,100 meters in the high mountains. In Grisons (Engadine) they even reach 2,300 meters in altitude.

The more common varities of trees are among the resinous kinds, the Norway Spruce (Picea excelsa) the Silver Fir (Abies pectinata) the Larch, the Scotch and Mountain pines, the Cimbrian pine; among the deciduous kinds, the beech and the chestnut trees; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value of per hectare (2½ acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1904 the expenses incurred by the Confederation for forest administration amounted to $112,600.

The following were the net receipts from State Forests in 1903 as to a few cantons:

Berne, 787,000 francs or 60 francs per hectare of forest.

Soleure, 31,500 francs or 38.33 francs per hectare of forest.

St. Gall, 58,000 francs or 59.62 francs per hectare of forest.

Schaffhouse, 113,100 francs or 45.33 francs per hectare of forest.

Argovie, 151,600 francs or 49.73 francs per hectare of forest.

Thurgovie, 83,000 francs or 65.90 francs per hectare of forest.

Neuchatel, 58,000 francs or 30.26 francs per hectare of forest.

The net receipts from towns of their forests in 1903 were:

Winterthur, 99,100 francs or 91.07 francs per hectare forest.

Schaffhouse, 35,000 francs or 77.05 francs per hectare of forest.

St. Gall, 104,800 francs or 144.36 francs per hectare of forest.

Coire, 49,200 francs or 43.65 francs per hectare of forest.

On an average about 593 acres of forest have been created annually during the past thirty years, at the expense of the Confederation, the cantons and the owners of the grounds.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective.

In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-sliding, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforesting by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislatures prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, as high-forest, coppice with standards and coppice.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested, except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed in courses lasting two months is attached to this technical personnel and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterthur Fribourg, Coire, Soleure, Schaffhouse

The Chief Federal Inspector of Forests has an annual salary of 8.000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed, his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall who has a salary of 5,000 francs, receives twelve francs per day and five francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the forest is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare. In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

WURTEMBERG.

STATE FORESTS.

The state forests of Wurtemberg comprise 462,816 acres. Wurtemberg is a high land country, the average elevation above sea level being 1,607 feet. The soil is in general adapted for timber production. Of the various kinds of timber, beech occupies 24 per cent and pine about 60 per cent. The average annual cut of pine is 25,000,000 cubic feet, at an age of from 90 to 100 years, with a diameter varying from 11 to 20 inches breast high. In addition to this, the cut includes 16,000,000 cubic feet of wood, including refuse, which is sold for fuel.

The timber is generally sold in each administrative district at auction on written bids. The average annual expense of administering and managing the state forests in recent years has been between $1,428,000 and $1,666,000; but not including forestry instruction nor the purchase of additional land. The gross annual revenue has been between $4,284,000 and $5,236,000. In general, the net income from forest capital is 2½ per cent. In pure stands of coniferous forest clear cutting is practiced, in other forests selection cutting. There are no statistics showing what proportion of cutover land becomes reforested by natural seeding. About 4,500 acres are annually planted. The age of the plants varies from one to eight years, according to their kind, and their distance apart likewise varies from a foot and a half to six feet.

Under average conditions fifty women plant 8,000 four year old trees per hectar (2.47 acres), at a cost of from $19 to $23.80; while under more difficult conditions, especially very rough, rocky soil, the expense may be three times as great.

In the last three calendar years the annual damage by forest fires has been $404.60.

About 20,000 persons are annually employed in the state forests on 1,330,000 working days, all of whom reside in or near the forests. A scientifically trained forester ("oberfoerster") has charge on an average of 3,237 acres of state forest and 2,866 acres of forest belonging to communities and other public corporations, making together a district of 6,103 acres. His salary varies from $690 to $1,071 a year, besides free official residence or equivalent rent and traveling expenses. Every officer having been permanently retired after nine years' service is entitled to a pension. The pay of the retired officer on entering the tenth year of service amounts to forty per cent of his former salary. With each succeeding year of service to the fortieth, inclusive, the salary increases 1, one and three-fourths per cent of the salary up to $571.20, inclusive; 2, one and one-half per cent of the salary exceeding $511.20.

The highest forest board (K. Forstdirektion) is composed of a chairman with title of "Direktor," with a salary of from $1,975 to $2,070.60, and associate members, who if they are graduate foresters, have the title of "Forestrat" (counsellor) and "Oberforstrat" (high counsellor), with salary of from $1,332.80 to $1,785.

Forestry was first introduced in the management of state forests about the first quarter of the last century.

Previous to April 1, 1881, scientific instruction in forestry was given in the Hohenheim academy. It was then transferred to the government university of Tubengen. The attendance at the lectures fluctuates, and in the last twenty years has averaged thirty-five. There are no lower grade forestry schools. For the education of forest guards (Forstschutzbeamten), who are chosen from the ranks of non-commissioned officers, a three-months' course for about twenty students is annually held at the post of the royal forest guard (Forstwache).

Scientific observations have been made as to the influence of forest upon climate and upon rainfall. The results cannot be summarized in a few words, but it can be remarked that the influence of forests on climate has been overestimated, the influence being noticeable only within limited boundaries. A general increase in rainfall is not proven. The forest only causes a different distribution of precipitation in forest areas and surrounding country.

PRIVATE FORESTS.

The extent of private forests is 544,057 acres, of which forty per cent are managed on forestry principles. They consist, first, of those belonging to the royal house and to the nobility and the title to which is hereditary and the capital of which cannot be impaired.

TAXATION OF PRIVATE FORESTS.

Private forests are subject to real estate and income taxes. In regard to the first, the average obtainable net income from the forest is established on the assumption of its proper management and considering all the circumstances. This fixes the value of the forest. The income tax is a tax on the gross annual income derived from the forest after deducting all ordinary expenses. There is no essential difference between the tax of private forests and the tax of private lands used for agriculture.

SUPERVISION OF PRIVATE FORESTS.

In the case of protection, forests which are important in preventing land slides, and washing of the soil or as protection of adjoining planted forests of principally pine and where complete or extensive clearing is intended, it is necessary, before cutting, to obtain permission of the forest police authority. In other private forests permission is only necessary where a piece of timber land is to be permanently cleared for other purposes than forestry. Ordinarily a cleared forest must be replanted within a specified time. Likewise, owners of private forests are enjoined from acts which would endanger the forest, such as an excessive removal of leaves for litter. Ownersof private forests are required to notify the forest police authority of dangers threatening the forest from natural causes and destructive animals.

THE WORKING PLAN.

The "Manual of Forestry" in five volumes. by Dr. William Schlich, principal professor of forestry at the Royal Indian Engineering College, Cooper's Hill, England, and formerly Inspector General of Forests to the Government of India, is the best work on the subject in the English language. Dr. Schlich has kindly given me permission to copy from his third volume an account of the "working plan" as used in forestry, and what follows on that subject is taken from that volume.

Forest working plans regulate, according to time and locality, the management of forests in such a manner that the objects of the industry are as fully as possible realized. The working plan for a protection forest, or a park-like forest, is altogether different from that of a forest which is managed on economic principles. The latter is the kind with which we have here to do.

The working plan report is a document which gives necessary information and which describes the system of management in such detail as may be required in each case. For forests which are of great value, and which yield high returns, very detailed plans should be drawn up; for forests which give as yet only small returns, simple plans would be indicated.

Great Falls of the Big Fork River photographed at very low stage of water June 1900.

Mature Norway pine, 20 inches in diameter, breast high. Big Fork River, 1902.

WORKING PLAN REPORT.

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WORKING PLAN FOR A PORTION OF THE STATE FORESTS OF THE HERRENWIES RANGE IN THE BLACK FOREST, GRAND DUCHY OF BADEN.

PERIOD 1884—1893.

WITH THE RESULTS OF THE ACTUAL WORKING.

GENERAL DESCRIPTION.

1. *Area and Boundaries.*

The areas are recorded as follows:

(*a*) Productive area	**1,747 acres**
(*b*) Unproductive area	**nil. "**
(*c*) Other areas, including fields, meadows, etc. . .	**2 "**
Total area	**= 1,749 acres**

c. The third group comprises the so-called "Grinden," that is to say the highest parts of the ridges, which are mostly level and have a tendency to bogginess. They are covered by a dense growth of bilberry and heather, and are incapable of producing more than a stunted tree growth, which yields only a scanty quantity of firewood, frequently not covering the price of preparing it; hence financial considerations are entirely out of the question, the areas being protected merely for the sake of preserving some cover on the hill tops. The group comprises all parts which produce an annual increment per acre of 7 cubic feet and under; they amount to 10 per cent of the total area.

In so far as the management aims at the production of valuable material, and at favorable financial results as regards outlay for artificial regeneration (where natural regeneration has failed), for improvement, tending, etc., only the areas in the first group can be considered. But in the treatment of those forests which pertain to the principal mountain region of the Black Forest, representing a certain drainage area, the task of forestry goes beyond mere financial considerations. It has in fact been recognized that it is necessary to keep areas of this class well wooded for the sake of a proper husbanding of the water supply in the streams. Accepting this further task, the forest administration has endeavored, during the last 50 years, to afforest the poorly stocked and frequently entirely bare areas at the higher elevations of the Bunter Sandstein region. In so far as the cultural operations were confined to the boulder drifts of the Bunter Sandstein, they were moderately successful, but the cultural attempts made in the "Grinden" prior to 1870 turned out failures. Since 1873 the cultural operations in the Grinden present a more hopeful aspect, owing to the experience gained by former failures, and it seems desirable to continue them in the future.

The working plan deals in detail only with the forest area subjected to intensive management, but the group worked under the selection system has also been adequately noticed in the general provisions.

The working plan lays special stress upon the execution of improvement fellings, more particularly the removal of cancerous silver firs. For this purpose the ordinary thinnings are utilized; but over and above these, cancerous trees must also be removed from the old woods, where otherwise no further thinnings would be required. In regeneration fellings the trees to fall first under the axe must be those attacked by cancer. Even then not nearly all cancerous trees can be removed during the next ten years. This fact teaches the management that in future a sharp attack must be made on all cancerous trees at the time of the first and second thinnings, even if a temporary interruption of the canopy should thereby be caused. On the rich deep soils of the granite area, which are almost exclusively concerned in these remarks, even an interruption of the canopy extending over a somewhat lengthy period would not be a misfortune, and preferable to the maintenance of a full canopy consisting to a considerable extent of cancerous trees. The existence of enormous quantities of such trees on the granite area was one of the reasons which led to the yield being fixed at its present rate.

5. *Utilization.*

a. Yield of Major Produce.—The actual yield during the last 40 years has been as follows:

Compartment.	Yield, in Solid Cubic Feet.					
	1844-53.	1854-63.	1864-73.	1874-83.	Total.	Area in Acres.
1. Schwarzenbronn....	213,836	122,869	149,343	79,141	565,189	65
2. Schwarzenberg	311,518	158,778	200,733	158,955	829,984	211
3. Riesenkopf	12,502	47,288	206,242	65,617	331,649	75
4. Mehliskopf..........	....	....	....	....	....	34
5. Grünwinkel.........	19,742	124,629	57,423	202,252	404,046	282
6. Dobelbach...........	26,875	42,697	30,195	69,952	169,692	173
7. Hoher Ochsenkopf..	....	....	....	....	....	101
8. Kleingartenkopf....	84,256	2,331	1,448	1,024	89,059	75
9. Kleingarten.........	325,687	188,825	256,608	195,578	966,698	362
10. Grossgarten.........	62,544	46,688	26,417	59,118	194,767	175
11. Sachsenbronn.......	34,927	47,783	111,351	106,194	300,255	95
12. Gartenbach	86,311	83,345	494,665	156,412	820,733	172
	1,178,198	814,733	1,584,920	1,094,216	4,622,067	1,747
Average per year.......	117,820	81,473	158,492	109,422	115,552	....
Average per year and acre..................	67.44	46.64	87.86	62.63	66.14	....

From the appended statistical table it will be seen that the estimated increment of the next ten years amounts to 1,086,130 cubic feet.

The actual growing stock amounts to			9,488,731	cubic feet
The normal	"	"	7,892,160	"
The surplus of	"	"	1,596,571	"

The surplus of growing stock is due to a surplus of woods over 100 years ol With favorable prices for timber, the removal of this surplus in the shortest possible time would be advisable, so as to prevent loss of increment, and take unnecessary capitol out of the forest, but as prices run low at present, it appears judicious to keep the greater part of it over for a while.

A consideration of the several compartments showed that the removal of the following material during the next ten years is advisable on sylvicultural grounds:

Final cuttings . . .	1,146,000	cubic feet
Intermediate cuttings . . .	154,000	"
Total . . .	1,300,000	"

As this amount exceeds the expected increment by 213,870 cubic feet, equal to about one-seventh of the surplus of growing stocks, the yield has been fixed at 1,300,000 cubic feet, or annually:—

Final cuttings . . .	114,600	cubic feet
Intermediate cuttings . . .	15,400	"
Total . . .	130,000	"

If in the course of the 10 years prices should rise, there would be no objection to reduce the surplus of growing stock further by additional cuttings.

The climate is rough, and is characterized by long winters with an abundant snowfall, and by rapid changes of temperature; at the same time it is throughout favorable for forest vegetation, especially for conifers.

3. *Species.*

The details will be found in the description of compartments. Generally speaking, the spruce and silver fir are the prevailing trees, the former being more abundant in the middle and upper parts, the latter at the lower elevations. The beech is associated with them locally and in varying proportions. Scotch pine is found in the granite region chiefly upon dry, steep, rocky slopes with a southerly aspect, and in the sandstone region, especially on dry ridges and the top of the mountains, as well as here and there in other localities. The three conifers attain a maximum height of 140 feet, with regular shaped and little tapering stems. Toward the upper limit of the area the height growth diminishes rapidly, dwindling down to 20 or even 15 feet on the high plateaux. Here the mountain pine and the birch are also found. Reproduction is generally good, except at the higher elevations. A marked difference is found between northern and southern slopes, the growth and reproduction being far more vigorous on the former than on the latter.

The silver fir is much exposed to cancer. Windfalls and snow breakage are fairly moderate, while the damage from insect attacks is very small. During the years 1874-83, the following proportion existed between the different classes of fellings:

Cuttings caused by insect attacks = 1 per cent of total fellings.
" " snow breaks = 12 " " "
" " windfalls = 16 " " "
Cancer and other diseases and injury = 19 " " "
Other cuttings = 52 " " "
Total = 100 " " "

4. *Method of Treatment and Rotation.*

The situation and the species necessitate the area being treated under the high forest system. The quality gradations, as indicated under 2, are so conspicuous locally that it is possible (as well as desirable in order to secure a proper idea of the condition of the forest), to group the growing stock according to its characteristics as produced by the quality of the locality, and according to the method of treatment thereby indicated. The actual basis of this grouping is the yield, and based upon it, the net income or financial result of the management. In this sense the forest may be divided into the following three groups:

a. Areas Subjected to an Intensive Management.—To this group belong all areas which, in virtue of their quality (as indicated mainly by the height growth of the trees on fully stocked areas) are capable of producing large timber; areas on which carefully conducted regeneration fellings will produce natural regeneration within a reasonable period of time, and where the cost of any artificial assistance in regeneration is commensurate with the anticipated returns. As lowest limit of this group a normal increment of 43 cubic feet per year and acre, calculated for a rotation of 120 years, has been fixed. The area thus included in the group amounts to 78 per cent of the whole. It is with this area, and the growing stock standing on it, that the management must more especially reckon, and from which the largest possible sustained yield must be secured. With a suitable composition of the growing stock and a careful application of sylvicultural principles, that object may be obtained under an average rotation of 120 years.

As regards the sylvicultural treatment, and especially the regeneration of the woods, two different classes of forest or growing stock (corresponding with two qualities of locality) stand out prominently.

First: Forest of spruce with a strong admixture of silver fir (the latter occasionally predominating) more or less frequently interspersed with beech and more rarely with Scotch pine.

Secondly: Forest in which spruce prodominates with a slight admixture of silver fir and here and there of Scotch pine, but devoid of beech.

The first class of forest occurs in the granite area and on those parts of the Bunter Sandstein (clay sandstone), which have deep, easily decomposed soils fit to be classed as good. The characteristic features of this class of forest are the occurrence of beech and deep soils, rarely covered with boulders or debris, lying mostly at the lower elevations; natural regeneration can here be successfully effected in a comparatively short period of time.

The second class of forest occupies the stony slopes of the Bunter Sandstein area, and in exceptional cases the quartzite parts of the granite area. Here the soil is generally covered with loose boulders and rock debries of varying size. These areas are nearly all found at the middle to upper elevations. The conditions described demand the maintenance of an uninterrupted canopy up to the age of maturity, and a careful execution of the regeneration cuttings spread over a prolonged period of time, or else weeds will spring up, which make regeneration very difficult, and at any rate expensive.

On the whole, however, careful management is sure to be successful in securing natural regeneration in all the areas pertaining to this group; for this purpose, as well as for the production of valuable timber, a rotation of 120 years on an average is considered of sufficient length. The length of the regeneration period differs considerably in the different parts, varying on the whole from 30 to 50 years.

b. The second group consists of woods growing on soils, which, even under the most careful management, cannot be expected to produce trees of first or even second quality. The trees here produced are of such limited height growth, that the production of valuable timber is out of the question. The woods are found in the upper, and here and there in the lower part of the Bunter Sandstein area, where the soil is covered with large masses of the debris of gravelly sandstone, which is not easily decomposed, and where the slightest interruption of the canopy overhead is followed by the appearance of a dense growth of bilberry and heather.

Nevertheless, these areas are capable of yielding timber of the inferior classes, as well as firewood, and the returns which may reasonably be expected from them, justify the application of a method of treatment which, while avoiding any interruption in the canopy and all expensive cultural operations, facilitates natural regeneration; in other words the treatment under the selection system by removing all trees which are deteriorating or incapable of increasing in value. It is difficult to fix any definite rotation, but it is estimated that the trees will take about 150 years to reach maturity.

The lowest quality limit for this group has been fixed at 7 cubic feet increment per acre and year, while the upper limit is, as already indicated, 43 cubic feet. The area comprised in this group amounts to 12 per cent of the total area.

Alterations in the above figures will probably become necessary when a fresh survey is made.

The outer boundaries are in order, but the internal boundaries require rectification.

2. *Locality.*

The forest here in question occupies on the whole the slopes lying between a hill range on the south and the river Schwarzenbach on the north. The highest point of the hill range, the Hoher Ochsenkopf, has an elevation of 3,465 feet above the sea, while the lowest part, near the Schwarzenbach, is only 2,000 feet above the sea, the mean elevation being placed at 2,600 feet.

The slopes, on which the forest is found, are mostly steep, level spots being only found on the summits of the hills, and toward the lower end, where granite and Bunter Sandstein meet.

The area is drained by the Schwarzenbach (a feeder of the Raumünzach) with its two feeders, the Gartenbach and Dobelbach. The first mentioned runs from west to east, and the two latter, more or less, from south-west toward north-east. It follows that the forest in the valley of the Schwarzenbach has generally a north aspect, and in the valleys of the Gartenbach and Dobelbach a northwest aspect on one side, and a southeast aspect on the other side of the streams. All the forest areas (except those situated at the highest elevations and which are of no importance) are protected by intervening ranges against the prevailing winds.

Up to a mean elevation of 2,500 feet, granite is the principal rock, which is sometimes (though rarely) pierced by porphyry. Above the afore-mentioned elevation the granite underlies upper Bunter Sandstein (Vogesen Sandstein), and the latter accordingly prevails in the larger part of the forest area.

The granite is generally rich in orthoclase and oligoclase, and therefore decomposes readily, and furnishes mostly a deep soil rich in mineral elements. The decomposition is facilitated, and the quality of the soil improved, by the remarkably numerous springs which appear between the granite and the Bunter Sandstein. Hard slow decomposing quartzite is of rare occurrence.

The Bunter Sandstein is characterized by rapidly and greatly changing mineral composition, consisting sometimes of readily decomposing rock yielding a deep clay soil, in other cases of hard quartz-gravel, frequently found on the surface in the numerous bolder-drifts. The Bunter Sandstein has numerous rents and fissures in all directions, so that it is rapidly drained, and the disintegration and decomposition are only rarely assisted by springs, which at the best are scanty and intermittent. It follows that the Bunter Sandstein soils, even when formed by the easily decomposed and minerally rich clay sandstone, never equal the best quality of the granite soil; moreover, they change frequently and very suddenly, and without any visible cause, into almost unproductive areas.

On the flat hill tops, layers of fine white sand (produced by the disintegration of the gravelly sandstone) frequently produces an impermeable stratum, preventing the water from percolating, thus causing bogs (or "Grinde") which often extend over considerable areas and are almost unproductive.

The quality of the soil, therefore, ranges between good and unproductive, in the following proportion:

Good and fairly good to medium	= 78	per cent.
Medium to indifferent	= 12	"
Indifferent to unproductive	= 10	"

The disposal of the yield is effected as follows:

1) Free grant to the Roman Catholic Priest at Herrenwies,	=	1,500	cubic feet
" " " School "	=	1,000	"
(2) Sale by public auction and occasionally by private sale,	=	127,500	"
Total annual disposals		130,000	"

b. Minor Produce.—The principal items are forest pasture and the removal of litter, the utilization of which is permitted to the Herrenwies settlers, as a privilege.

According to government orders the privilege of forest pasture may be exercised only to such extent as the condition of the forest and the requirements of regeneration may permit. The district forest officer indicates from time to time the localities in which the privilege may be exercised. The privilege of removing litter free of charge is exercised under the same conditions. The exercise of these privileges is nowhere injurious, and may be continued during the next ten years.

The grass growing in blanks, on roads and in plantations has hitherto been sold for the benefit of the State, and, under suitable supervision, the practice may be continued.

The removal of building stones, the sale of plants, etc., is insignificant.

6. *Division into Compartments.*

The contemplated new division into compartments must be postponed until the projected road system has been completed.

DESCRIPTION OF COMPARTMENTS.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
I. Ochsenköpfe.			
Schwarzenbronn	1	65	Spruce with silver fir, some beech, Scotch pine, larch. About .6 of area 30—50 years old, some trees older. About .4 of area 10—30 years old. Above the road fairly complete stocking; in youngest parts still suffering from frost; below road still some blanks caused by late cutting out of old trees; in the latter part still 120—150 years old spruce and silver fir in the final stage; these show a decreasing increment. Growth on the whole fairly good.
Schwarzenberg	2	211	*a* = 130 acres; 15—40 years old spruce and silver fir with some Scotch pine and beech; some lately planted, younger, a few up to 60 years old. About 25 acres planted. Where the shelter wood has been removed, stocking generally complete, in the rest still patchy with patches of bilberry intervening. Growth generally between good and fairly good; along Herrenwies meadows partly only fair, the spruce still suffering from frost. In the north-western part, below the road, on the Riesenkopf road, and in the south-east along Dobelbach, on about 87 acres 110—140 years old spruce and silver firs of decreasing increment are standing in the final stage.

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
			b — 81 acres (in three parts), spruce and silver fir with a few beech and Scotch pine, generally 50—75 years old, but some small groups only 30—50 years old; generally well stocked, here and there somewhat thin and patchy. Growth between good and fairly good. On 8 acres on the Dobelbach, 80—90 years old spruce, cover complete and growth good.
Riesenkopf...........	3	76	*a* — 47 acres; 100—130 years old spruce and silver fir, some older; on the whole cover fairly complete; toward compartment Schwarzenberg somewhat thin, but on about 10 acres with a fair young crop of silver fir and spruce up to 15 years old. Growth fairly good, on the higher part inferior. About 5 acres along the road is a windfall area, now stocked with some silver fir and spruce growth. *b* — 24 acres; 9—20 years old spruce (a few older), with some Scotch pine and larch, mostly well stocked, showing good to fairly good growth. *c* — 5 acres; Grinde, in upper part heather covered, with 100 and more years old short and stunted Scotch pine, some spruce and mountain pine. On the whole poorly stocked. Part underplanted with 20—40 years old spruce, which show very poor growth.
Mehliskopf...........	4	84	50—90 years old (and more), mountain pine with some spruce, Scotch pine, birch and mountain ash; toward compartments 3 and 5 cover fairly complete, in the southern and south-western parts interrupted by larger and smaller areas of heather. Growth inferior.
Grünwinkel...........	5	202	*a* — 186 acres; 110—150 years old, some older, spruce and silver fir, some beech with a few Scotch pine. In irregular final and seeding stage, in the southern part cover still fairly complete in strips. On .4 of the area stocked with up to 80 years old silver fir and spruce and a few beech. Growth of old trees still fairly good; on some stony ridges (about 7 acres) middling and inferior; young growth mostly only middling. *b* — 16 acres on the highest part in the south and west, Grinde; heather-ground with 100 and more years old crippled Scotch pine, spruce, some mountain pine and birch; in some parts up to 60 years old advance growth thinly stocked. Here and there traces of plantings, 24 years old spruce.
Dobelbach............	6	178	*a* — 133 acres; 100—130 years old, some up to 200 years, spruce and silver fir, some Scotch pine; on the whole cover fairly complete; only in the western third along Grünwinkel through windfalls and dry wood cuttings somewhat thin and patchy; in the thin parts as yet little, up to 15 years old, advance growth in single trees. Growth good to fairly good. (Ilex found). *b* — 27 acres (consisting of the upper south-eastern portion and a ridge running from it in a north-western direction to the centre of the compartment), 100—130 years old (some older), short-stemmed spruce with some Scotch pine and silver fir forming a thin, often very thin, wood; in parts younger up to 60 years old spruce, or an incomplete miserable under-

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
			growth of 25 years old spruce and Scotch pine (experimental planting). Growth middling to inferior. *c* — 18 acres (uppermost part on the south) Grinde; heather land with 100 years and more old crippled Scotch pine, some spruce, birch thinly stocked; here and there remnants of 25 years old planted spruce and Scotch pine.
Hoher Ochsen........	7	101	70 and up to over 100 years old Scotch pine and mountain pine with spruce, some birch, sometimes forming a very thin wood of single trees, sometimes in smaller or larger groups; everywhere intersected by heather places and blanks. Growth inferior, even crippled.
Kleingartenkopf.....	8	76	100—120 years old, in some parts younger, some over 300 years old, spruce with Scotch pine, few silver fir, some mountain pine. In the western third and on the eastern point still fairly well stocked, some groups even well stocked; otherwise the wood is very thin and open. Growth middling to inferior; here and there an incomplete miserable undergrowth of 30—50 and more years old spruce and Scotch pine (planted).
Kleingarten..........	9	362	*a* — 161 acres; spruce and silver fir, some beech. Mostly 50—80 years old, in strips and single trees up to 100 years old, others only 30—50 years old. In the eastern part are about 50 acres 80—100 years old. Everywhere spruce and silver fir standards up to 150 years old, mostly showing good growth. Almost throughout rather thinly stocked, here and there patchy, in consequence of late final cuttings and removal of cancerous silver firs. Growth mostly good, only toward the southern higher part decreasing. *b* — 122 acres (in 3 places); spruce and silver fir with some beech, $\frac{15—40}{\text{average} — 30}$ years old, some groups up to 50 years; mostly fully stocked. 120—150 years old (some older) mostly pruned spruce and silver firs in the final stage are standing almost everywhere over the above younger growth. The strip along Dobelbach is finally cleared. Growth good; of the old trees fairly good. *c* — 79 acres (upper part toward the south), 120—300 years old pruned Scotch pine and spruce, few silver fir and birch, thinly stocked, often open; on the whole poorly undergrown with 20—50 years old spruce (mostly planted), a few silver fir; the latter in some places form, with up to 100 years old spruce, the picture of a selection forest. Soil much covered with heather. Growth middling to bad; rarely fairly good. On 6 acres near compartment Dobelbach on the main path, 100 and more years old spruce, with a few Scotch pine and silver fir, form a thin canopy and show middling growth.
Grossgarten..........	10	175	*a* — 108 acres; spruce and silver fir 80—110 years old, some up to 150, some beech and a few Scotch pine. Partly fully stocked, but the greater part somewhat thin, in the lower part very thin; and here spruce and silver fir advance growth up to 50 years old in single trees and groups. Growth good to fairly good; in

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
			the upper parts with stones (Halde), partly middling only. *b* — 87 acres. (Ridge through middle of compartment and strip on south, southwest, and northwest.) 90—110, some up to 200 years old, spruce and Scotch pine, some silver firs, in the uppermost part some mountain pine in a thin, patchy, and often very thin wood; most of inferior growth; here and there traces of 80—40 years old spruce plantings. *c* — 80 acres (adjoining compartment Kleingarten). A wood resembling a selection forest, of spruce and silver fir with beech, the trees 80—60 years old prevailing; little quite young. The 100—120 years old and older trees appear single and in groups. Growth good; above the cattle track inferior.
Sachsenbronn........	11	95 (and 2 acres other areas.)	100—120 years old (some up to 200 years), spruce and silver fir, also some beech, namely: On 42 acres, final stage, partly pruned, throughout with $\frac{10-80}{20}$ years old (in the western part up to 40 years old), silver fir and spruce young growth; about 25 acres in the position of the seeding stage brought about by windfalls and dry wood cuttings; on 5 acres 80—100 years old, generally complete cover; in the thinner stocked parts is found up to 15 years old silver fir and spruce young growth; on 12 acres (southeastern corner, near compartment Gartenbach) generally canopy complete, here and there with a little advance growth. On 10 acres (in the west), 70—90 years old, some older spruce with silver fir, fairly complete canopy. On 7 acres (western point), 12—40 years old (in groups and single up to 60 years old), mostly irregular young growth of spruce with some silver fir, forming a fairly complete stocking. Growth of old trees good to fairly good, in the pruned portions partly less good; growth of young wood fairly good.
Gartenbach	12	172	110—140 years old spruce, silver fir, some older, some Scotch pine, the latter prevailing in places in the upper part, few beech; in the northern two-thirds in the final stage, partly in seeding stage. In these two-thirds about 85 acres are stocked with young growth of spruce and silver fir pretty completely, in the eastern part very fully; in the southern third still fairly complete cover, but on the western slope, already somewhat thin, as yet little young growth. Growth in northern two-thirds good, in the southern third good to fairly good; in the upper part, in the southeast, only middling. In the middle of the compartment are 3 windfalls and 1 beetle clearing, together 12 acres; of these, 7 acres fairly well stocked with up to 25 years old spruce and silver fir.

Year.	Description of Cuttings, Cultivation, etc.	Cutting.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final Cubic feet.	Intermediate Cubic feet.			
Provision of Working Plan.						
	Final cutting in regenerated part..	34,000	....	....	....	....
	Filling up blanks with spruce	....	....	3	....	....
	Thinning and cutting of cancerous silver firs........................	....	10,000	....	....	....
	Total...........................	34,000	10,000	3	....	....
Execution.						
1884	Final cutting......................	14,297	....	....	....	....
1884	Dry and windfall wood............	818	....	....	....	....
1885	Windfalls	665	....	....	....	....
1886	Final cutting, thinning...........	6,166	832	....	....	....
1886	Windfalls	547	....	....	....	....
1887	Windfalls	1,868	....	....	....	....
1888	Final cutting, thinning...........	7,759	11,717	....	....	....
1888	Planting...........................	....	....	1.7	....	....
1888	Windfalls	82	....	....	....	....
1889	Dry wood, windfalls...............	649	....	....	....	....
1889	Planting...........................	....	....	2.2	....	....
1890	Windfalls	698	....	....	....	....
1890	Planting...........................	....	....	.1	....	....
1891	Planting...........................	....	....	.2	....	....
1892	Planting...........................	....	....	.1	....	....
1893	Planting...........................	....	....	.1	....	....
	Total...........................	33,084	12,549	4.4	....	....

TABULAR STATISTICAL REPORT

Compartments.		Distribution of Age					
		1—40 years old.		41—60.		61—80.	
Name.	No.	Cubic feet.	Acres	Cubic feet.	Acres	Cubic feet.	Acres

I. Working-section—Yield-capacity over

Name.	No.	Cubic feet.	Acres	Cubic feet.	Acres	Cubic feet.	Acres
Schwarzenbronn	1	48,030	41	70,630	20	......	......
Schwarzenberg	2	200,945	117	169,514	40	192,117	40
Riesenkopf	3	19,072	34	......	......	......	......
Grünwinkel	5	21,189	38	......	......	......	......
Dobelbach	6	......	......	......	......	......	......
Kleingarten	9	109,479	87	201,299	37	423,787	67
Grossgarten	10	26,487	24	46,617	11	25,074	5
Sachsenbronn	11	28,605	51	......	......	35,316	5
Gartenbach	12	13,420	48	......	......	......	......
Total	......	467,227	440	488,060	108	676,294	117
Normal state under a rotation of 120 years	......	......	......	......	......	......	......
Comparison of real and normal state +	......	......	......	......	......	......	......
Comparison of real and normal state —	......	......	......	......	......	......	......

II. Working-section—Yield-capacity from

Name.	No.	Cubic feet.	Acres	Cubic feet.	Acres	Cubic feet.	Acres
Dobelbach	6	1,770	......	......	......	......	......
Kleingartenkopf	8	10,596	25	......	......	......	......
Kleingarten	9	10,948	25	......	......	......	......
Grossgarten	10	......	......	......	......	......	......
Total	......	23,318	50	......	......	......	......
Normal state under a rotation of 120 years	......	......	......	......	......	......	......
Comparison of real and normal state +	......	......	......	......	......	......	......
Comparison of real and normal state —	......	......	......	......	......	......	......

III. Working-section—Yield-capacity 7

Name.	No.	Cubic feet.	Acres	Cubic feet.	Acres	Cubic feet.	Acres
Riesenkopf	3	......	......	......	......	......	......
Mehliskopf	4	......	......	......	......	18,900	34
Grünwinkel	5	......	......	......	......	......	......
Dobelbach	6	......	......	......	......	......	......
Hoher Ochsenkopf	7	......	......	......	......	......	......
Total	......	......	......	......	......	18,900	34
Normal state under a rotation of 120 years	......	......	......	......	......	......	......
Comparison of real and normal state +	......	......	......	......	......	......	......
Comparison of real and normal state —	......	......	......	......	......	......	......

Summary of the

Name.	No.	Cubic feet.	Acres	Cubic feet.	Acres	Cubic feet.	Acres
Real state of forest	......	......	......	......	......	......	......
Normal state of forest	......	......	......	......	......	......	......
Comparison of real and normal state +	......	......	......	......	......	......	......
Comparison of real and normal state —	......	......	......	......	......	......	......

OF THE HERRENWIES RANGE.

Classes.						Volume per acre, cubic feet.	Increment.			
81—100.		Over 100 years.		Total.			Annual, per acre.		Total in 10 years.	
Cubic ft.	Acres	Cubic ft.	Acres	Cubic ft.	Acres		Normal	Real.	Normal.	Real.
43 cubic feet per Acre Annually.										
....	......	84,350	4	152,910	65	2,352	85	70	55,250	45,500
15,392	2	118,062	12	697,180	211	3,304	85	75	179,350	158,250
....	......	381,408	37	400,490	71	5,641	70	61	49,700	43,310
....	......	1,606,861	143	1,628,050	186	8,753	85	71	158,100	132,060
....	......	1,522,104	133	1,522,104	133	11,444	100	71	133,000	94,430
353,156	49	540,329	48	1,628,050	283	5,753	100	78	283,000	220,740
494,418	49	365,870	49	958,466	138	6,945	85	85	117,300	117,300
42,879	5	459,108	34	565,408	95	5,952	100	71	95,000	67,450
....	......	1,373,758	124	1,387,178	172	8,065	100	86	172,000	147,920
905,845	105	6,402,845	584	8,939,771	1,354	6,603	....	76	....	1,026,960
....	......	....	......	7,456,200	......	5,507	92	......	1,242,700	....
....	......	....	......	1,483,571	......	1,096	....	......	....	....
....	......	....	......	....	......	....	....	16	....	5,740
7 to 43 cubic feet per Acre Annually.										
....	......	38,850	27	40,620	27	1,504	30	21	8,100	5,670
....	......	208,418	51	214,018	76	2,816	14	14	10,640	10,640
....	......	108,419	54	119,367	79	1,511	43	29	33,970	22,910
....	......	79,460	37	79,460	37	2,148	21	21	7,770	7,770
....	......	435,147	169	453,460	219	2,071	....	21	....	46,990
....	......	....	......	362,880	......	1,657	28	......	60,480	....
....	......	....	......	90,580	......	414	....	......	....	....
....	......	....	......	....	......	....	....	7	....	13,490
cubic feet and under per Acre Annually.										
....	......	4,500	5	4,500	5	900	7	7	350	350
....	......	....	......	18,900	34	556	7	7	2,380	2,380
....	......	11,300	16	11,300	16	706	7	7	1,120	1,120
....	......	7,400	18	7,400	18	411	7	7	1,260	1,260
....	......	53,400	101	53,400	101	529	7	7	7,070	7,070
....	......	76,600	140	95,500	174	549	....	7	....	12,180
....	......	....	......	73,080	......	420	7	......	12,180	....
....	......	....	......	22,420	......	129	....	......	....	....
....	......	....	......	....	......	....	....	......	....	....
Three Working Sections.										
....	......	....	......	9,488,731	......	....	....	......	....	1,086,130
....	......	....	......	7,892,160	......	....	....	......	1,315,360	....
....	......	....	......	1,596,571	......	....	....	......	....	....
....	......	....	......	....	......	....	....	......	....	229,230

SPECIAL WORKING PLAN.

COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
1. Schwarzenbronn..	Final cutting in regenerated part..............	84,000				
	Filling up blanks with spruce.................			8		
	Thinning and cutting of cancerous silver firs....		10,000			
	Total...............	84,000	10,000	8		
2. Schwarzenberg....	*a* Thinning of shelterwood and partial final cutting..............	85,000				
	Filling up blanks with spruce and Scotch pine.			10		
	a and *b* Thinning and removal of cancerous trees..................		58,000			
	Total...............	85,000	58,000	10		
3. Riesenkopf........	*a* Seeding cutting, and partly final cutting..... *b* and *c* Rest.	58,000				
	Total...............	58,000				
4. Mehliskopf........	Rest.					
5. Grünwinkel.......	*a* Thinning of shelterwood, seeding cutting in the fully stocked parts by the removal of cancerous and large trees................. *b* Rest	818,000				
	Total...............	818,000				
6. Dobelbach.........	*a* Thinning and removal of cancerous trees...... *b* and *c* Rest.	19,000	19,000			
	Construction of an export road to meet the main road............					4,900
	Total...............	19,000	19,000			4,900
7. Hoher Ochsenkopf	Rest.					
8. Kleingartenkopf..	Rest.					

SPECIAL WORKING PLAN—*Continued.*

COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
9. Kleingarten	*a* Cutting of all old standards and cancerous trees	45,000				
	Thinning		8,000			
	b Thinning of shelterwood and partially final cutting	198,000				
	Filling up blanks with spruce			12		
	c Cutting out of old defective trees where young growth exists	14,000				
	Construction of an export road to meet the main road					9,500
	Total	257,000	8,000	12		9,500
10. Grossgarten	*a* Thinning and removal of cancerous trees	47,000	47,000			
	b Rest.					
	c Removal of standards and cancerous trees	25,000				
	Thinning		15,000			
	Construction of an export road					5,000
	Total	72,000	62,000			5,000
11. Sachsenbronn	In the regeneration area: thinning of shelterwood and partially final clearing; in the rest seeding cutting	168,000				
	Filling up blanks with spruce			8		
	Construction of an export road					8,500
	Total	168,000		8		8,500
12. Gartenbach	Continuation of regeneration cuttings and removal of cancerous trees	195,000				
	Thinning in fully stocked parts		7,000			
	Filling up blanks with spruce and Scotch pine.			8		
	Construction of an export road					8,000
	Total	195,000	7,000	8		8,000

SUMMARY OF THE PROVISIONS OF THE

Compartment.	Provisions of Working Plan.					
	Cuttings.			Cultivation. Acres.	Draining. Feet.	Road Construction.
	Final. Cubic Feet.	Intermediate. Cubic Feet.	Total Cubic Feet.			
1. Schwarzenbronn......	34,000	10,000	44,000	3	....	....
2. Schwarzenberg.......	35,000	53,000	88,000	10	....	....
3. Riesenkopf...........	53,000	....	53,000	....	....	....
4. Mehliskopf...........	....	....	....	....	....	....
5. Grünwinkel..........	313,000	....	313,000	....	....	....
6. Dobelbach............	19,000	19,000	38,000	....	....	4,900
7. Hoher Ochsenkopf...	....	....	....	....	....	....
8. Kleingartenkopf.....	....	....	....	....	....	....
9. Kleingarten..........	257,000	3,000	260,000	12	....	9,500
10. Grossgarten..........	72,000	62,000	134,000	....	....	5,000
11. Sachsenbronn........	168,000	....	168,000	3	....	3,500
12. Gartenbach..........	195,000	7,000	202,000	8	....	3,000
Total............	1,146,000	154,000	1,300,000	36	....	25,900

NOTE.—The excess was due to heavy windfalls; it will not derange future

WORKING PLAN AND OF THE EXECUTION.

Results of Actual Work Done.						Comparison of Proposed and Executed Cuttings.		Remarks.
Cuttings.			Cultivation. Acres.	Draining. Feet.	Road Construction. Feet.	Cut too much. Cubic Feet.	Cut too little. Cubic Feet.	
Final. Cubic Feet.	Intermediate. Cubic Feet.	Total. Cubic Feet.						
33,034	12,549	45,583	4·4	....	....	1,588	....	
54,517	75,000	129,517	5·0	....	....	41,517	....	Excess due to windfalls and snow-break.
132,900	....	132,900	·1	....	....	79,900	....	Excess due to windfalls and snow-break.
....	....	....	....	....	....	....	....	
177,169	....	177,169	·1	....	....	....	140,331	Held back, on account of extra fellings in other compts.
86,606	68,301	154,907	....	....	5,008	116,907	....	Excess due to windfalls.
....	....	....	....	....	....	....	....	
....	....	....	....	....	....	....	....	
342,444	21,635	364,079	8·4	....	9,679	104,079	....	Excess: windfalls and construction of road.
95,852	....	95,852	....	....	5,299	....	33,148	Thinning held over.
111,049	....	111,049	·9	....	3,691	....	51,951	Held back on account of excess in other compartments
197,660	....	197,660	....	....	2,958	....	4,340	
1,231,231	177,485	1,408,716	18·9	....	26,625	108,716	....	

arrangements, as there is yet a considerable excess of growing stock in the forest.

SOME NOTICES OF THE PRESS DURING THE PAST TWELVE YEARS.

The principle on which the present work in Minnesota is based is that *prevention* of fires is the chief remedy. * * This report is one of the most valuable documents of its kind which has been published. * * It will be widely called for, and gives an object lesson to other parts of the country.—*Boston Herald* (1896).

The annual report of the Chief Fire Warden of Minnesota, Mr. C. C. Andrews, is a document of value to all interested in forestry. As Mr. Andrews says, when people understand the benefits to be derived from a rational management of our forest lands, then, and not till then, will there be a public sentiment that will make the Fire Warden Law as effective as it should be. The attempt which Minnesota is making to prevent forest and prairie fires is indeed a commendable one.—*Outlook* (N. Y.)

Very notable contribution to the literature of forestry.—*American Lumberman.*

Since the establishment of the office the state has been singularly free from destructive fires.—*Minneapolis Lumberman.*

Apart from the importance of the subject, the masterly way with which it is handled makes this report of 137 pages a gem of its kind. This compilation of data represents an immense amount of painstaking labor, on which an active mind and a strong hand has done first-class service.—*St. Louis Lumberman.*

The Fifth Annual Report of the Chief Fire Warden of Minnesota is not exactly a magazine, but it has illustrated pages, it deals with nature, and it is full of information about forests in this and other countries. Don't fail to get this report. It is exceedingly valuable. Here is a chance for the schools to become intelligent concerning our Minnesota forests and concerning forestry generally.—*School Education.*

A most interesting document. * * This movement is full of hope for the future of American forests.—*Chicago Standard.*

The public mind needs to be educated on the subject, and a report like this will have an excellent effect.—*Minneapolis Journal.*

State document of great value.—*Farm, Stock and Home.*

Gives evidence of able and energetic work on his part.—*Popular Science Monthly.*

This document gives a great deal of valuable information. * * The letters sent by the fire wardens and others throughout Minnesota to their Chief in reply to his circular of inquiries are remarkably intelligent and interesting.—*American Architect and Building News* (Boston).

We should like very much to see it duplicated in Wisconsin.—*Eau Claire Leader.*

Exhibits the fact that the Chief Fire Warden is in close touch with the fire wardens in each town in the state.—*Roseau Times.*

The Minnesota law is one of the best and most progressive in force in any of the states.—*Gifford Pinchot, Chief of the U. S. Division of Forestry.*

RESOLVED, As a fundamental proposition of rational forestry, we commend the well-organized effort of the State of Minnesota to suppress forest fires, being aware that no advance can be made in forest management without such protection.—*Resolution adopted by the American Forestry Association.*

Under the vigorous administration of the present Chief Fire Warden much has been done to promote the growth of a correct public sentiment and not a little has been accomplished in the actual prevention and suppression of fires.

Warning notices in great numbers have been posted and the intelligent cooperation of a large force of assistant wardens has been secured. During the drought in the early summer of the present year over 300 fire wardens were in correspondence with their chief, reporting precautions taken, and otherwise showing their interest and activity. The system is doubtless capable of improvement, but in its inception and reasonably successful working a great step has been taken, and by so much Minnesota is well in advance of Michigan and Wisconsin. —*Prof. V. M. Spalding of the University of Michigan, in "Science" for December 28, 1900.*

Minnesota is taking a foremost place among the commonwealths that are giving attention to forestry. The annual reports of General C. C. Andrews, really forestry reports, are of great interest and value.—*Democrat Chronicle*, Rochester, N. Y. (1901).

Preventing fires by careful watching and prompt punishment for law breaking hunters and campers, and also by quick action in stopping incipient fires are the chief means resorted to to protect the forests from conflagration. This sort of work Chief Fire Warden Andrews is doing in Minnesota to as great an extent as is possible with the means at his disposal to do with.—*Farm, Stock and Home*, Minneapolis (1906).

While it is never safe to speak too glowingly of a service that has been performed while there is yet danger of failure, it has undoubtedly been proven that the work of the department of the chief fire warden of Minnesota has been efficient during the years since it was created.—*Mississippi Valley Lumberman* (1906).

[From Gen. Henry L. Abbot, Colonel of Engineers, U. S. Army, retired, one of the commission appointed by the National Academy of Sciences to consider and report a forest policy for the United States and upon whose report the forest reserves were established.] CAMBRIDGE, MASS., June 29, 1901.

Mr. C. C. Andrews, Chief Fire Warden, St. Paul, Minn. Dear Sir: Please accept my thanks for the copy of your annual report for the year 1900, which has come safely to hand. I need not say how much those who appreciate the value of our forests admire the good work you are doing for their proper treatment.

Yours truly, HENRY L. ABBOT.

For the twelfth time, Minnesota's Prophet of Forestry, Gen. C. C. Andrews, presents to the government and people of the State his annual report. For nearly thirteen years Gen. Andrews has given to the forestry interests of the State the most painstaking and conscientions study; to the protection of its forests against fire, in his capacity as chief fire warden, the most vigilant watch-care. * * *

But his service as fire warden, important as it has been, has not paralleled in magnitude that which he has sought to render in the capacity of a public teacher of the principles of forestry. By the conditions of the act creating his office, it was made a part of his duty to "disseminate information concerning forestry." That part of his commission he has interpreted in the terms of the enthusiast—more and more so as the mistakes and wastefulness of the State's policy toward its lumbering interests became clear to him, and he perceived the necessity of providing—in Minnesota, the traditional "home of the pine" and the storehouse of a forest wealth once deemed "inexhaustible"—against a treeless future. He has been indefatigable in traveling over the State as the herald and exponent of a rational forestry. In lectures before schools, colleges and societies; in frequent contributions to the newspapers; in conversation with individuals and in labors before legislative committees, he has presented such an array of facts and figures as should, as the result of his work, have made Minnesota foremost among all the States in its provisions for maintaining its forests and averting an impending lumber famine. His annual reports have been masterly in their presentation of the forest situation here as compared with that in Europe and in other States of our Union, and in their arguments, verbal and pictorial, for the substitution in Minnesota of a wealth-producing for a wealth-destroying system.—*Pioneer Press*, St. Paul, Minn., Aug. 6, 1907.

From Mr. S. Bayard Dod, President First National Bank, Hoboken, N. J. June 7th, 1904. "I beg to acknowledge with thanks the handsome and interesting copy of your report. Certainly Minnesota is *facile princeps* in this work."

From Mr. Albert K. Smiley, Mohonk Lake, N. Y. November 22nd, 1902. "Again I thank you for a copy of your most attractive Annual Report which I am now reading with the greatest interest. I ought not to take the time now. but the fact is it is a difficult matter to refrain from reading a work of so interesting a character, and especially so tastefully gotten up, and so finely illustrated and printed."

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MINNESOTA FORESTRY BOARD

First Annual Report

OF THE

STATE FORESTER

WM. T. COX..................*State Forester*
DILLON P. TIERNEY, *Asst. State Forester*

DECEMBER 31, 1911

STATE EDITORIAL ASSOCIATION PAYS VISIT TO DOUGLAS LODGE IN ITASCA PARK
Minnesota Forest Service Photo

MEMBERS OF THE MINNESOTA STATE FORESTRY BOARD.

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ESTHER BERGSTRAND (Secretary's Office)	Stenographer

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M. J. Thornton	Deer River
L. F. Johnson	Bemidji
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E. A. Linder	Warroad
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Edgar E. Chappell	Ely
Hans Kasper	Grand Marais
Percy C. Records	St. Paul

Inspectors.

Wm. M. Byrne	Fire Protection of Railways
Arthur F. Oppel	Reconnaissance

Special Assignments.

P. T. Allen, Forest Survey	International Falls
Fred Kueffner, Telephone Construction	International Falls

July 12, 1912.

Hon. Z. D. Scott, President, Minnesota State Forestry Board.

Sir: In accordance with the provisions of Section 3, Chapter 125, Laws of 1911, I have the honor to transmit herewith the first annual report of the Minnesota Forest Service for the year ending December 31, 1911. Of necessity, the chief work of the first year has been fire protection, and this matter has been given the greatest amount of attention. To properly safeguard the forests is a step which must necessarily precede the more technical work and greater task of reforestration.

Minnesota has an immense timbered region, the products of which are by no means exhausted, and if fire is excluded from all the cut-over areas. more timber will grow each year than is used.

There are approximately 28,000,000 acres in the state bearing timber of some kind, and of this area probably 15,000,000 acres will always remain in forest. The forest products on the lands that will be cleared for agricultural purposes are of enormous value, and the economical use of this asset will have its influence in shaping the state's developmnet. The 15,000,000 acres which will always remain in forest, whether privately or publicly owned, should as rapidly as possible be put in the best condition for maintaining and growing a permanent timber supply. The best use of the land and timber is the aim of the Forest Service.

Respectfully,

W. T. COX,

State Forester.

Duluth, Minn., July 16, 1912.

To His Excellency, Adolph O. Eberhart, Governor of Minnesota.

Sir: Pursuant to the requirements of Section 3, Chapter 125, Laws of 1911, the Minnesota State Forestry Board has the honor to transmit herewith the report of the operations of the Board for the year ending December 31, 1911.

Very respectfully, your obedient servant,

(Signed) Z. D. SCOTT,
President Minnesota State Forestry Board.

THE MINNESOTA FOREST SERVICE.

CHAPTER I.

GENERAL INTRODUCTION.

The earliest settlers in Minnesota pre-empted those lands along her southern and western boundaries, which may properly be called prairies. Groves of hardwood timber were frequent. They necessitated some clearing, but furnished protected farmsteads. The prairie land was rapidly settled. Soon, even before the Civil War, pre-emptions were being made on land heavily timbered. Here the blazed trail and the marked tree displaced the sod road and the heap of stones; no plowing could be done until the ax had cleared the way.

At that time, a virgin forest covered more than five-eighths of Minnesota's surface, or approximately 33,000,000 acres. Undiscouraged by the immensity of the task before them; urged on by the potential wealth contained in the forests themselves, and the latent wealth in the soil which bore them, the pioneers continued their labors in the forests and prospered. Since that time, approximately 1848, the process of exploiting the forests of Minnesota has gone on with increasing extent year after year, and is still going on. Settlers who cleared their land for farming; lumbermen, railroads through their need of cross-ties, and a number of other interests, have been satisfying the demands for forest products. They have removed from Minnesota uncounted billions of board feet of the finest timber. In addition to the vast amount of timber cut by the above-mentioned agencies in developing Minnesota's forest areas, we must take into consideration the immense amount of timber which has been destroyed by fire—fire caused frequently by those who were enriching themselves from the wilderness; who, regarding the timber of Minnesota as an inexhaustible resource, were unable to foresee the desolation which was the inevitable result of carelessness.

From the foregoing, one might think that the forests of Minnesota must ere now be exhausted. Not so. In spite of the billions of board feet of timber which have been removed by the various

HARDWOOD—POPLAR AND BIRCH IN THE RAINY RIVER COUNTRY.

agencies, human and elemental, beneficial and destructive, there yet remain, out of the original 33,000,000 acres of forest land, 28,000,000 acres which bear forests of some kind. In fact, Minnesota has today the greatest forests of any state east of the Rocky Mountains.

HOW THE GREAT FORESTS ARE DIVIDED.

The "Great North Woods" is more than 300 miles wide along the northern boundary, and extends 364 miles north and south. The southern portion of this immense area, containing mostly hardwoods, is known as the "Big Woods." Adjoining the Big Woods on the north are the "Pineries," consisting of nearly pure stands of white, Norway or red and jack pine. North of the true Pineries is a vast region containing rich forests of spruce, cedar and tamarack, and enormous quantities of the finest birch and poplar. There is also much pine, especially in the high, rocky country north of Lake Superior and east of the Little Fork river. The country from the Little Fork and Rat Root rivers westward to the Red River valley, embracing an area of 5,000,000 acres, is a densely forested district. Spruce, tamarack and cedar here frequently form stands so dense that they are difficult to penetrate. Here poplar and paper or canoe birch attain their best development on the continent, and, if fires are kept out, will furnish material for many mills in the future.

TIMBER WORTH $975,000,000.00.

Computing the value of Minnesota's forests to her people, we are confronted with impressive figures. There are approximately 75,000,000,000 feet of merchantable timber standing in the woods. This has a stumpage value of at least $4.00 a thousand. The wages paid out in logging and manufacturing amount to at least $8.00 a thousand, and for transportation an average cost of $1.00 a thousand may be added. This means, then, that the mature timber now standing has a value to the people of Minnesota equivalent to $975,000,000. This does not take into consideration the value of the forests as a field from which successive crops of timber are produced, nor its importance in maintaining conditions favorable to the existence of big game and game fishes. The game animals and fish in their present abundance attract thousands of people from outside the state and bring a large revenue to our citizens. Then, too, the forests are an important influence upon the climate of the state, and in regulating stream flow. Minnesota is rich in streams used for navigation and water power, with enormous possibilities for future development.

Minnesota's immense forests, so long regarded as inexhaustible and as requiring no attention save in selfish exploitation, are now becoming a matter of more general interest. Their protection and their conservative, rather than wasteful, development are seen to be a necessity.

PROFESSOR GREEN.
The late Professor Samuel B. Green, who was one of the foremost advocates of forestry in Minnesota.

MEN WHO CONSERVED FORESTS OF THE STATE.

A few men have been largely responsible for the development and fostering of the existing popular interest in Minnesota's forests. One of them, Gen. C. C. Andrews, was made chief fire warden by the passage of a Forest Preservation Act in 1895, the year succeeding the Hinckley fire. At that time he began, alone and unassisted save by a few far-sighted men, to advocate the preservation of Minnesota's forests from fire. To this end,

GEN. C. C. ANDREWS.
Who has made a hard fight for the preservation of the forests and has sought legislation to protect this great natural resource from destruction.

he studied the laws and methods of other states and countries. The features of those other forest policies which were applicable to Minnesota needs were incorporated into his work here so far as possible. He urged from time to time, and succeeded in securing the passage of new additions to the forest laws, all of a progressive nature.

As in all new work, the chief difficulty in carrying out the good features of those laws was in securing adequate working funds. Other obstacles, of a less tangible but not less real nature, were encountered. Among them was the popular lack of active realization of the broad economic value of the forests, and of the fact that they are not inexhaustible. To instill into the people the true meaning and present needs of the forests, basically necessary to forest welfare, became Gen. Andrews' aim. To it he devoted every means in his power. In this work his most influential co-worker was the late Prof. Samuel B. Green. In the work of creating and extending popular interest in the forests, the State Federation of Women's Clubs has been of invaluable assistance. Many of the most practical features of former laws, as well as of the present law, were only made possible through the active interest of a few of the more far-sighted lumbermen.

Prof. Green, primarily a horticulturist, realized as did few other of his contemporaries the true value of the forest to the people. Consequently, he took an active part in the work of preserving, and urged the perpetuation of Minnesota's forests. With the opportunity of his position as professor of horticulture at the College of Agriculture, his influence was largely instrumental in founding the College of Forestry at that institution. He was created director thereof, and procured the aid of trained foresters as his assistants. Before his death, Prof. Green, co-operating with Gen. Andrews, had made great strides in forestry in Minnesota. The work of these men, backed up by others, a few of whom had forestry educations, paved the way for the passage of the present forest law, with its up-to-date features. Many of the latter have been incorporated almost directly from former forest laws.

CHAPTER II.

THE NEW FOREST LAW.

Minnesota's voters, partially awakened to forest needs, authorized the passage of a forest law in 1911. It permits, on a broader basis than any preceding law, the systematic care of their forest resources in the future.

The terrific forest fires which have devastated large areas in former years culminated in the Baudette-Spooner disaster in 1910. At that time, the awful catastrophe of 1894, known as the "Hinckley fire," had not yet been forgotten. These fires, together with many others equally large, were factors in influencing the public, which had already commenced to grasp the meaning of forestry and to realize the enormous benefits which would result through its practice in Minnesota. Added to the effect which the destruction of life and property by great fires of former years exerted upon forest legislation was the people's dawning realization that the forests in Minnesota are not inexhaustible; that this great resource, whose extreme value to the people may be only approximated—this principal, from which the interest has been so great—is, beyond a doubt, diminishing under existing conditions.

REALIZING NOW THE VALUE OF THE TIMBER.

The people began to see, at least vaguely, that something must be done to prolong, if possible to perpetuate, the existence of this wonderful asset of the state. Their sentiment is expressed in the law passed at the 1911 session of the state legislature. The desire for forest protection and conservation was at that time not so strong as it should become in the future. In the contest which the bill evoked before it became a law, the appropriation asked to carry out its provisions—small at the best—was cut in two ere the passage of the bill. This was unfortunate. Without reasonably adequate funds, any organization with constructive work to do must be seriously handicapped in that work. (See appendix for copy of law.)

CHAPTER III.

THE TASK OF THE SERVICE.

Immediately after the new law became effective, the Forestry Board was installed to administer it. The board has complete authority to supervise the forestry work of the state. Its first duty was to select an Executive Agent, or State Forester. This was done at once. The latter, in accordance with section 4 of the law, selected an Assistant Forester. The Forester and his Assistant assumed the duties of their offices in May. Their first care was to outline a policy for the Forest Service and place a force of men in the field to enforce the regulations and carry out the provisions of the law.

The ordinary popular idea of forestry has been largely confined to that phase of the science which has to do with the prevention and control of forest fires. This undoubtedly is an important and serious consideration. Where fires are allowed to run it is impossible for young forests to spring up or plantations to develop. Fire protection became, therefore, the primary duty of the new service.

ELIMINATION OF FIRE DANGER ATTEMPTED IN 1911.

It was to aid in fire protection that the federal co-operative fund of $10,000.00 was obtained. In fact, conditions demanded that practically all the funds available in 1911 be used in work leading to the eventual elimination of the fire danger. The methods adopted to bring about this end constitute, therefore, the substance of the report for 1911. The prevailing idea that the task of the Forest Service will be achieved when it has done away with the fire danger is erroneous. This protection is rather a precautionary measure which must be taken first to assure the continued existence of our remaining timber for proper usage, and to permit of replacing that which is already gone. It will always be necessary to guard against the recurrence of fires An advance step, which accompanies the first, is to ascertain and classify the location and extent of such land as will be more profitably devoted to the perpetual growing of timber than of other crops. There are great areas of this nature, of at present indefinite extent, in Minnesota. One problem to be adopted is reforesting such areas as have been cut or burned, and upon which natural reforestation is not taking place. These are limited as compared with the enormous areas on which young tree growth is coming of its own accord.

PROPER UTILIZATION OF FORESTS, PRESENT AND FUTURE.

Furthermore, it is the duty of the Forest Service to urge and bring about a more conservative utilization of our forests, present and future, in their diversified applications. This relates not only to the scientific cutting of standing timber, which is in itself an end. It has to do also with the best use of the products and by-products of the timber after it has been logged and removed from the forest. Profitable utilization of that immense proportion of the standing tree which has formerly been absolutely wasted in the process of manufacturing the finished article of commerce is a vital question demanding the immediate attention of every trained forester and of every thinking, practical manufacturer of forest products.

These are some of the broader features of the task of the Minnesota Forest Service. In dealing with them, step by step, each in proper sequence, the service will be forced to consider a multitude of details, each in itself a separate problem. Some of those details which are met in the endeavor to do away with the fire danger, the first step in the forester's ladder, are enlarged upon in this report. The future success of the Forest Service in rehabilitating and conserving the forests depends in no small degree upon its present success in securing to them fire protection. While perfecting the latter, which is precautionary, it will be possible to lay foundations upon which to base other operations, made practical by the removal of the probability of forest fires. In addition to purely fire protection work done in 1911, tentative plans have been outlined and some steps taken along other lines in the Forest Service policy. Because of its fundamental nature, fire protection was the immediate object of Forest Service work in 1911.

CHAPTER IV.

GENERAL ORGANIZATION.

When the Forester and his Assistant assumed office in May, the season of probable fire danger was already well advanced. The most pressing need of the service then was the organization of a field force to put into effect the new forest law and the policy based upon it. A great many men of all sorts had applied for positions in the service. The selection from among the applicants of those who were best qualified for forest officers was undertaken without delay.

FEDERAL GOVERNMENT GIVES $10,000.00 FOR WORK IN MINNESOTA.

Incidental to the selection of men for the field organization, a successful endeavor was made to obtain financial aid in fire protection from the Federal Forest Service. A department, called "State Co-operation," is maintained by the Federal Forest Service. Its purpose is to assist fire protection work, with co-laboration and funds, in states where forests are of national as well as of state importance. Such co-operation is conditioned upon the enforcement of an adequate forest law. The big factor which determines the relative importance to the nation of the forests of any state is the extent to which they protect the headwaters of navigable streams. The Forester realized the dependence of the upper Mississippi and its tributaries, with other streams, upon the forests, and knew of the state co-operation department of the Federal Service. Therefore he felt justified in seeking the aid of the latter. The state forest law being found reasonably satisfactory by the Federal Service, and because of the state's important watersheds, a co-operative agreement was made between the federal and state services. By it the latter received $10,000.00 from the former for use in 1911. The agreement specified that the funds so furnished should be used only in paying salaries of patrolmen. The latter might be assigned to duty only on the headwaters of navigable streams. The entire fund of $10,000.00 was employed in hiring sixty-one patrolmen, who were placed on duty during various periods of the fire season. That this aid was obtainable permitted of retaining a larger number of patrolmen than would have been possible without it.

SELECTING RANGERS AND PATROLMEN FOR WORK IN THE WOODS.

Every applicant considered was given a personal examination by the Forester or his Assistant. Three classes of men were to be appointed: District rangers, one to be placed in charge, under the Forester, of each of the twenty large districts into which the forested area of the state was divided; patrolmen, state and federal, to work under the direction of the district rangers. Of these patrolmen, an average complement of four to each ranger district was made possible by the federal aid. Great care was exercised in making appointments because of the important nature of duties involved. Personal characteristics, experience and woods training, as well as executive ability, were the determining features in the choice of men. Those possessing the best qualifications were given appointments as district rangers.

The field officers directly connected with the Minnesota Forest Service —that is, who received their authority, orders and salaries through the headquarters office of the service—were divided into three classes—district rangers, state patrolmen and federal patrolmen. The district rangers and state patrolmen were paid for their services directly from the money appropriated for forestry purposes from the state treasury; the federal patrolmen from the $10,000.00 co-operative fund furnished by the Federal Forest Service. Payments for the latter were made from Washington, in accordance with a monthly payroll made out by the district rangers and approved by the State Forester.

EXCURSION INTO WOODS TO VIEW FEDERAL WORK.

On June 24, the earliest possible date after the task of selecting the field men was completed, those who had received appointments as district rangers were called together by the Forester in a meeting at Cass Lake. Here excusions were made into the Minnesota National Forest, the headquarters of which are at Cass Lake, for the purpose of viewing the practical work being carried on by the Federal Service. The policy of the State Service was outlined to the rangers, and a campaign for the remainder of the year planned. At the conclusion of the meeting, each ranger was assigned to one of the districts—his headquarters being fixed at some town centrally located.

By June 26 all had left for their respective districts. Work commenced at once for every ranger. So far as was possible, the men had been assigned to territory with which they were familiar to some extent. However, the districts were so large that in very few cases was the ranger acquainted with all portions of his district. Since, to effectually perform the duties of a forest officer, a man must know well the geography, the peculiar conditions, and particularly the people of the territory for which he is responsible, no ranger delayed in getting into the field.

HOW RANGERS AND PATROLMEN GO ABOUT THEIR WORK.

Because the physiography of Northern Minnesota varies so widely, different means of getting about are of necessity used in different districts. In some, canoeing and walking are the only means over large areas. In some districts the railroad facilities are better than in others. Conditions in some of the western districts permit of using a team or saddle horse to advantage. In a few districts all the above means of covering the ground are available.

Every district ranger works under the direction of the State Forester, and is held responsible to him for the affairs of his district and in exercising the authority with which he is entrusted under the law. That authority covers a wide range and diversity of detail. All rangers are required to keep a diary of business transacted, and to report to state headquarters at least once a month—oftener if any special contingency demands. They are authorized by law to arrest and bring action against any individual, company or organization that may violate or fail to comply with the regulations and provisions of the forest law. The activities of patrolmen, state and federal, are controlled by the ranger to whose district they are assigned. Rangers are responsible for, and held to an accounting of, all Forest Service equipment—canoes, boats, tools, tents, etc. All features of the service work in any district are administered directly by the ranger of that district, acting for the Forester, or by the patrolmen, acting for the district ranger. While the Forester and Assistant visit each district as often as is possible, to advise with the ranger concerning district affairs, much discretionary power is of necessity left to the latter.

A RESPONSIBILITY LIES ON THE FOREST RANGER.

A ranger's work is administrative to a large extent. Every ranger has a territory, directly under his supervision, larger than most of the counties in the state. Most of the summer routine work of a district is of necessity left to the patrolmen. In time of bad fires, rangers are expected, and instructed, to remain quite closely in their headquarters; this, in order that they may keep in touch with affairs in all portions of their districts. Should a ranger leave headquarters to go to a certain place outside for any length of time, there would be danger of fire in some other portion, where his advice or his presence might be absolutely necessary, with no opportunity to reach him. Of course, with a large or dangerous fire, a ranger will go to it and organize the fire-fighting. His duty in such a case is to put a good man in charge of that fire, then return to his headquarters in readiness for another. Furthermore, the amount of office work necessary to systematic business requires the presence of a ranger in his headquarters a number of days each month, even when fires may not be probable. In fact, while a ranger goes about the country as much as possible, there are certain important portions of his work which can be best attended to only at headquarters.

All of the original number of rangers—twenty—remained on duty until November. It was then deemed best to enlarge some districts and decrease their number to fourteen. The summer's work had shown where this could be advantageously done, to create a more concentrated organization and reduce the expense. The fourteen districts into which the forested area of the state is now divided are shown on the accompanying map. The rangers in charge of them are permanently employed, and will form the nucleus of the field organization of the Forest Service.

WORK OF THE PATROLMAN—HIS VIGIL IN THE WOODS.

In 1911, the appointments of state patrolmen took effect on July 1. Those who had accepted reported for duty at that time to the rangers of the districts to which they had been assigned. Rangers had taken the field on June 26. Between that date and July 1, when the first patrolmen reported, each ranger had formed at least a temporary plan for placing the latter where they could do the most effective work. In most cases, these plans were later modified. Each ranger subdivided his district into smaller patrol districts (called "beats" for want of a better word), which in some cases comprised twenty towns. A patrolman was placed in charge of each beat, with a definite headquarters, or station, where he could be reached by mail at stated intervals.

Immediately upon taking the field it was required of every patrolman that he acquaint himself with all characteristics of his territory, and especially with the people. He sought, for future reference, the location of areas which were most liable to fire. He learned the rivers, roads, trails and open regions—all the means of rapid travel and advantageous lines of defense in case of fire. Many patrolmen worked out definite patrol routes, which they covered as often as necessary in the performance of their chief duty—guarding against the occurrence of fires. They were supplied with tents, axes, shovels, mattocks and other simple equipment necessary to living and working in the forest. For this they receipted to the ranger responsible for it, and were in turn held responsible by him for its care. Where there were good water routes in their beats patrolmen were furnished canoes. In the latter case, or where horses were used, sets of fire-fighting tools were carried.

AUTHORITY GIVEN PATROLMEN TO MAKE ARRESTS.

Patrolmen were endowed with police powers to enforce the forest law. They were empowered to summon aid in the case of fire, to demand the observance by the people of the requirements of the law, to make arrests when necessary; and were responsible to the rangers in carrying out the details of their work. Their principal duty was, of course, the prevention and control of fires. In this connection, they posted warning notices and explained the law and the aims of the Forest Service to the public. In rainy weather, when fires were unlikely, employment was always at hand in erecting watch towers on commanding sites selected in going about the country, in compiling maps from data obtained when on patrol, in clearing out trails and portages, and other work of a similar useful character.

WHERE TRAILS GIVE OUT FOREST OFFICERS MUST BUILD RAFTS TO CROSS THE NAMELESS LAKES, NORTHERN COOK COUNTY.

Rangers took care to select points for patrol headquarters which could be reached quickly by telephone if possible, at any rate by mail. Thus, in any emergency, a patrolman could quickly get in touch with the ranger, and vice versa. Patrolmen were required to keep a diary, recording therein the business of each day. These were forwarded to the ranger once a month, to be summarized together with his own. While the nature of a ranger's duties was such that he must spend a part of his time in district headquarters, he devoted the greater part of it to going about his district advising with the patrolmen, supervising the work of the latter, planning new activities for them, and looking after such matters as were beyond the authority of the patrolmen.

Some state patrolmen were retained until Jan. 1, 1912, to assist the rangers in looking after slash disposal, four being retained all winter. Most were laid off duty in October; others were furloughed until the beginning of the next fire season.

$10,000.00 IN FEDERAL AID USED IN PAYING PATROLMEN'S SALARIES.

The co-operative agreement with the Federal Service, described previously, under which $10,000.00 was furnished by the Federal Forest Service to that of Minnesota for the paying of salaries of patrolmen was not perfected until July. Appointments of patrolmen under its provisions were made as soon as authorized. The men, called federal patrolmen, were assigned to duty in those districts which embraced the headwaters of navigable streams. Here their duties became much the same as those of the state patrolmen. The latter, however, were paid $70.00 a month, while the former received $2.25 a day, straight time. (All patrolmen and rangers are on duty every day, including Sundays.) In accordance with the terms of the agreement, federal patrolmen were to be employed on any work relating to fire protection; their salaries only were to be paid from the $10,000.00 of federal money. All necessary equipment and expenses (patrolmen received no reimbursement for expenses save when detailed on special work which called them outside their beats) were to be furnished from the state funds. The federal fund was used in this manner, and by November was entirely expended.

CHAPTER V.

DECREASE IN FIRE LOSSES.

The value of federal co-operation in 1911 with the Minnesota Forest Service cannot be overestimated. The additional $10,000.00 rendered available by the co-operative agreement permitted the employment of a force of patrolmen nearly double the size of the force which it would otherwise have been possible to retain. State expenditures, as itemized under "Summary of Expenditures," were of such an important nature that to have cut their aggregate by $10,000.00 would have been inadvisable, even impossible. Consequently, had this aid not been available, even the insufficient force of patrolmen in the field in 1911 would have been decreased by almost one-half. This would have meant at least a proportionate decrease in the amount of educational work done in the state, the value of which is incalculable.

There were 144 fires reported in 1911, which resulted in an approximate damage of $18,615.00. It is fair to assume that a one-half decrease in the number of patrolmen would have meant that at least one-half of these fires would have gotten beyond control, with an entirely disproportionate increase in the amount of damage done. It is fair to figure, taking into consideration the prevailing state of mind toward fires in previous years, that with one-half of the watchful patrol force eliminated, far more fires would have been set and would have escaped from careless burning than estimated amount of damage.

Progress along other lines—tower building, trail improvement and map-making—would not have been so great as is the case had the season's patrol was actually the case. This would have resulted in a further and not-to-be force been smaller.

Since the federal patrolmen were stationed in districts which embrace the headwaters of navigable streams, their work was of national as well as of state importance. From either viewpoint, the returns from the expenditure of the $10,000.00 federal funds were greater than the sum itself would indicate.

STATE AND FEDERAL GOVERNMENTS CO-OPERATE IN HARMONY.

The Federal Forest Service aided the state in other ways than by furnishing direct financial assistance. The men employed on the two National Forests in Minnesota were appointed special rangers of the Minnesota Forest Service, to serve without pay in looking after the state interests within the National Forests. The National Forests also co-operated in the construction of lookout towers and the clearing of trails and portages, where this would be of mutual advantage to both the national and state services. The two organizations work in harmony at all times to their common benefit. On one Indian reservation (the Fond du Lac), the Indian Department co-operated with the state service in paying the salary of one patrolman; the latter worked directly under the direction of the district ranger, and remained on duty all winter, looking after slash disposal. The men paid directly by the state, and those furnished on a co-operative basis by the Federal Service, constituted the principal field organization of the State Forest Service. This was further augmented during the summer, especially in dangerous periods, by a subsidiary force composed of patrolmen hired by private concerns.

A LOGGING CAMP IN THE "PINERIES."
Minnesota Forest Service Photo.

LUMBER COMPANIES FURNISH PATROLMEN.

While, previous to 1911, laws were in existence which required the burning of slash resulting from timber cutting, they had not been enforced to any extent—largely because of lack of funds. Consequently, a number of large areas of slash of dangerous character were found by the rangers and patrolmen in 1911. Since they had been left uncared-for in palpable violation of the law, it was possible to demand that they be protected from burning in the dangerous season. Accordingly, where any area of slash was sufficiently menacing to warrant the action, those responsible were requested to install at their own expense a patrol force adequate to prevent the area from burning at a time when it would endanger adjoining property. Because of the general normal rainfall after July 15, it was unnecessary to have these patrolmen on duty constantly. The companies concerned were therefore instructed to have men in readiness to go on duty during any dry period which might occur—they to work under the general supervision of the district rangers. Some of the more progressive timber-holding concerns retained men voluntarily, and at their own expense, to guard against fires in their standing timber. These men were uniformly instructed to co-operate with and seek advice from the State Forest officers.

RAILROADS JOIN IN THE FIGHT AGAINST FIRE.

Not only did timber operators or owners, through compulsion or voluntarily, place patrolmen on duty. The railroads, those important factors in the forest fire problem, are required under the law to eliminate as far as possible that part of the fire danger for which they are responsible. As one of the most effective modes of preventing forest and prairie fires along railroads, the roads which traverse regions where fires are probable were required to put on patrolmen during dangerous periods. The latter were to follow on speeders the day trains and to extinguish while small any fires which might be set. A step preliminary to the actual demands for installation of patrolmen by the railroads was an examination by each ranger of railroad conditions in his district. In making them, the rangers considered the number and character of trains which passed through their districts, particularly those between 7 o'clock in the morning and 7 in the evening. Ordinarily, engines do not set fires at night, the coolness and dew preventing. Grades were another feature considered by the rangers, together with conditions adjoining and upon the rights-of-way. A big engine, without adequate fire prevention devices, pulling a heavy freight train up a steep grade on a dry, sunny, windy day, with a quantity of inflammable material alongside the track which may ignite from a spark, and with wide stretches of forest or prairie adjoining the right-of-way for fires to invade—is the combination of conditions which is most certain to result in serious fires being started by locomotives. Taking into consideration, therefore, the degree in which these conditions were to be found on railroads in his district, each ranger was prepared to figure out the necessary amount of patroling to be done thereon, and to present the same as a demand to the proper railroad officials. The latter, for practically all roads traversing the forested area of the state, showed themselves willing, in promise and practice, to conform to any reasonable demand for patrol service made upon them by the Forest Service.

TRAINMEN ON WATCH FOR INCIPIENT FIRES.

In reality, because of the wetness of the season, there were only a few instances when it was deemed necessary to have special patrolmen installed. Generally speaking, the trainmen furnished sufficient patrol, being required to report at the next stop any fire they saw on the road. Thus, measures to control it might be set in motion. Also, section hands were required to maintain a careful lookout for and extinguish any fire started on the right-of-way, whether by a locomotive, by a cigar stump carelessly thrown from a car window, or by a camp fire built by a specimen of the genus "Hobo." In addition, railroads were required to post warning fire notices in conspicuous places at stations. The fact remains, however, that the railroads were willing to place on duty special patrolmen upon demand of a ranger when need arose, the special men to be under the supervision of the ranger. In addition, permission was given by many railroads, in fact by all save one, for State Forest officers to use "speeders" on their lines. The State Service accordingly purchased speeders, with which some of the rangers were supplied. These afforded a very rapid and convenient means of travel for rangers through certain parts of their districts, and permitted of their observing conditons along the roads while en route.

AN AMALGAMATED FIRE PROTECTIVE ORGANIZATION.

Thus, the fire protection force of the Minnesota Forest Service in 1911 was composed of, first, a quite specific organization made up of district rangers and state and federal patrolmen, together with the national forest men as special rangers, and the co-operative Indian reservation patrolmen. With these is a subsidiary organization more or less definitely under the supervision of the Forest Service, made up of patrolmen furnished by timber-cutting corporations and by railroads. This secondary organization was capable of considerable expansion in emergency cases, and did at times prove to be of great assistance. To the specific and subsidiary organizations might be added the officers of towns, villages and cities in the forest region, who are required by the new forest law (section 24) to do all in their power to bring about the elimination of the fire danger. The entire Forest Service scheme of organization is based upon a principle which might be compared to a telephone system: The St. Paul office of the Forester being the clearing house for all messages, connected by radiating wires to the district rangers, each acting in turn as "central" for a further system of wires, connecting with the various kinds of patrolmen and all the features of the work. This system permitted of quick communication from one point to another of the organization, and of rapid concentration of forces, tending to effective fire control.

CHAPTER VI.

FEATURES OF WORK, 1911.

Elimination of danger from prairie and forest fires is the basic issue in the policy of the Minnesota Forest Service. In doing away with the fire evil, the control of what fires may become started is, of course, an important step. Co-existent with and of even deeper importance than the control of fires—which in all possible cases should be extinguished when incipient—is their prevention. It is an old saw, but a wise one, which states than "An ounce of prevention is worth a pound of cure." Therefore, while in no manner has the control of fire been neglected in 1911, the greatest efforts of the Forest Service in that year tended toward its eventual disappearance as an obstacle in the path of forest conservation.

WATCHING ENGINES, SETTLERS, CAMPERS AND PLEASURE SEEKERS.

The business of fire prevention has to do with a variety of agencies from which fires result. The spark and the live coal from the steam engine, be it railroad, log-loader, dredge, or thresher, must be either done away with or rendered ineffective. Settlers, the men who clear rights-of-way, loggers, and all who cut timber for any purpose, must be taught to dispose of their slash so that it will not be a menace, and to use judicious care in that disposal. Campers, whether hoboes or legitimate pleasure-seekers, and all who traverse the woods, must be prevented from being careless with their camp-fires and pipes. Indiscriminate burning of hay lands and wild grass lands must be guarded against. Fires caused by lightning are the only kind of fires which it is really impossible to prevent. That the Forest Service will ever have to be on the lookout for fires, which will always be possible, is evident. To attain the highest efficiency, a number of methods must be employed. The ways and means by which the Forest Service intends to prevent costly fires are various. Some, in fact all, of the preventive measures described below are by their nature of great value as well in the quick and sure control of fires.

PREVIOUS LACK OF ORGANIZATION DISASTROUS.

Previous to 1911 some efforts had been made in Minnesota to prevent and control prairie and forest fires. These endeavors, due to inadequate funds and a consequent lack of organization, were successful only to a limited extent. The state work of fire protection was rapidly becoming looked upon as a farce; abuse in collecting fire-fighting claims and claims for damages assumed startling proportions because no efficient system had been devised for their investigation and settlement. In some localities fires were unquestionably set, that wages might be earned in fighting them. There were instances when farmers stacked their hay close beside railroad tracks that it might surely be burned and more than its value collected in damages from the railroad company. There was a general lack of system in preventing forest and prairie fires. State regulations for the disposal of logging and clearing slash were successfully evaded.

It was with this unfortunate state of affairs that the new Forest Service had to contend. It became necessary, immediately upon the commencement of field work in 1911, to show the people generally, and large corporations in particular, that a change had come to fire protective work in Minnesota. For a settler, logger, railroad official, or any other individual, to promise that he would clean up or care for, as directed by the service, a specified dangerous spot or area of brush for which he was responsible, and then not to do so, no longer sufficed. Such a man found that he could not evade the steady persistence of the Forest Service men; oftentimes he was angered, but in the majority of cases the required work was eventually performed. It was easier to induce a man to do a second similar piece of work—always one example had a beneficial effect on others.

The same obtained in claims for fire fighting. People in remote localities sent in large claims in 1911 for fire fighting done in 1910, as they had been accustomed to do in former years, not doubting but that they would be paid. All of these claims were promptly sent to the nearest ranger for investigation, and many were found to be excessive—some fraudulent Those who had hopefully sent in fraudulent claims were astonished to have them disallowed. Such people were inclined at first to contest their claims, and did so, until they found that such matters were no longer a case for trifling—that they were not going to be paid more than they deserved. This rankled, but they were compelled to abide by the ranger's decision. Consequently, people became careful.

CAMPAIGN OF EDUCATION FOR THE FOREST LAW.

The new forest law was made known to the public. If an individual violated any of its provisions unconsciously, that provision was read to him by a forest officer; second violations were unusual. The new law was made a subject of general discussion at any gathering where a forest officer was present. Copies of the law were distributed; its salient sections were published in local newspapers. Cloth warnings were conspicuously posted. Every available means of publicity was utilized.

An indirect, but nevertheless valuable, aid in teaching the necessity for fire protection was the financial co-operation of the Federal Service. Minnesota's people were shown that they are not alone in working for forest preservation; they have learned that the subject is of national as well as of local importance. It has been demonstrated clearly that, once the state has seen fit to adopt protective measures and finance them, the federal government is glad to aid the state, not only with advice, but with a substantial sum of money. All of which is an incentive to further efforts.

By personal contact, general discussion and newspaper publicity, the idea that a new era in forest protection had arrived in Minnesota was widely disseminated. This idea was more firmly fixed by the concrete examples of Forest Service work. The lookout towers and other improvements demonstrated that the service was permanent. At the St. Paul Land Show in November, a booth was maintained by the Forest Service and received much attention. A monthly magazine,. devoted to the good of Minnesota forests and calculated to arouse general interest in them, has been published by the Minnesota Forestry Association since Nov. 1, 1911. This magazine, the official organ of the service, is called the "North Woods." In it the intention is to publish illustrated articles which will deal with the economic value of the woods from every point of view, so that it will appeal to everyone interested in the woods. Insofar as time and funds permitted, no means was neglected of publishing and fixing the idea that the Minnesota Forest Service is a permanent institution on a systematic working basis. In this good work the patrolmen, by virtue of their widely extended personal contact with the settler, and because of the earnest nature of the men themselves, were of very great assistance.

TREMENDOUS STRAIN INCIDENT TO THE FOREST FIRES.

The terrible forest fires such as destroyed Hinckley, Chisholm, Baudette and Spooner should be object lessons to many other villages and cities in the wooded region of Minnesota, where fires are liable to occur. It is always possible in a dry season like that of 1910, which is especially vivid in recollection, that one or more fires may get beyond control of even a most vigilant fire-fighting organization, with disastrous results. There are many northern villages and cities situated in the heart of the forest, with timber or brush encroaching upon all sides. Any one of them, with a raging fire like that which destroyed Baudette and Spooner, could quickly be wiped out of existence; under present conditions. The residents of these villages and cities have in past years known the worry caused in dry seasons by the prospect of approaching fire. Many of them have known their homes to be saved only by the intervention of shifting winds, which hurled the flames in another direction, or by a timely rainstorm. Many have fought for weeks, as the fire alternately approached and receded, to protect their homes, and have come out, even if victorious, exhausted in body and mind, fit subjects for medical care. This statement is not exaggerated, but it is not expected that people unfamiliar with fires in the woods can realize the awful strain which accompanies the terrific physical exertion of opposing such an uncertain and treacherous enemy. If continued for any length of time, fire fighting, because of the nervous tension under which one labors, accompanied by the effects of heat and smoke, is killing work. Moreover, for the period that the fires rage, all business must be neglected, entailing financial loss to all concerned.

NEED OF FIRE-BREAKS ABOUT VILLAGES IS OBVIOUS.

It is possible for any such village or city to eliminate much of the worry preceding and the hard labor accompanying the fire season. A double fire-break properly made, and according to the special needs of any municipality or even unorganized village, would accomplish much. It would furnish in itself an effective obstacle in the path of, and would afford a double line of defense against the invasion of a fire. Every city or village exposed to fire danger should not delay in constructing, where needed, a substantial fire-break. This measure would not only save the people from much of the terror and labor of the fire season; it would also result in direct financial benefit. It would make property in the village or city a better fire risk, decreasing the premiums on fire insurance. In fact, insurance companies have refused to write insurance in some municipalities which are in particularly dangerous situations. By taking advantage of natural features—existing roads, lakes, rivers and open fields—a village may often protect itself in this way at very small cost. In some cases the work to be done will not be greatly decreased by such natural assistance; there the greater cost will be justified by the greater danger to which the municipality is at present exposed.

FIVE-MILL TAX AUTHORIZED FOR FIRE PREVENTION.

A fire-break should be at no outside point less than one mile from the city limits. Local conditions will necessarily require different methods in different places. Experience has demonstrated that certain methods of

constructing a fire-break are cheaper and more effective than others. The Forest Service officers are ready to give advice and assistance to any vil-
Under "organization" (page ——), it has been shown how those re-
lage or city which desires to so secure immunity from destruction by forest fire.

A village or city which needs fire protection is authorized to take the necessary steps in securing it by section 24 of the 1911 Forest Law, which is here quoted:

> Section 24. The State Forester may appoint supervisors, constables and clerks of towns, mayors of cities and presidents of village councils, fire wardens for their respective districts, and it is hereby made their duty to do all things necessary to protect the property of such municipalities from fire and to extinguish the same.
>
> All towns, villages and cities are hereby authorized and directed to take necessary precautions to prevent the starting and spreading of forest or prairie fires and to extinguish the same, and are hereby further authorized to annually levy a tax of not more than five mills upon a taxable property of such municipalities, which, when collected, shall be known as the "Fire Fund," which shall be used in paying all necessary and incidental expenses incurred in enforcing the provisions of this act.
>
> In all townships constituted within any of the forest patrol districts which may be established by the State Forestry Board, the respective town and village officers shall co-operate as far as possible with and act under the general supervision and direction of the state forest officers.

Any municipality taking advantage of this opportunity to protect its residents and their property will not only be complying with the law; it will be benefiting itself to a degree not to be estimated.

CHAPTER VII.

CONSTRUCTING FIRE-BREAKS.

In 1911 something was done along the lines described above. Two instances in kind were carried out under the advice and, in the Baudette-Spooner fire-break, under the direct supervision of officers of the Forest Service. These serve to illustrate what may be accomplished by any village or city if the project is gone about in the right spirit, and are told of in detail below, with photographs and costs.

The forest fires of 1910, which caused the great areas of dangerous windfalls previously described, were especially disastrous for many miles east and west along the Canadian boundary, and burned over a large district to the southward. In their course these fires destroyed forty lives, and probably more, since several people have been unaccounted for, and the homes of a great many settlers. The little cities of Baudette and Spooner, situated on the northern boundary line of Beltrami county, were wiped out of existence, not having learned, or at any rate profited, by the lesson taught in the preceding paragraphs.

By June, 1911, new homes and new and better cities had arisen from the ruins. Business went on as before, in spite of the fact that the surrounding forests were in a condition which rendered probable another disastrous fire. It was immediately necessary to take drastic steps for the safety of these communities and the outlying districts.

$3,000.00 CONTRIBUTED FROM THE 1910 RED CROSS FUND.

As the most effective means in securing fire protection, the construction of an extensive fire-break was at once begun. Its estimated cost was so large that the Forest Service was unable to furnish the money. Consequently, $3,000.00 of the amount remaining from the fund of 1910 which was contributed for the fire sufferers was appropriated to carry on the work.

In all, 24 miles of fire-break were constructed, being completed in the fall. The most pressing need, protection of Baudette and Spooner, was first considered. A fire-break, seven miles long, was drawn completely around the cities on the south, west and east, joining at each end with Rainy river, which protects them on the north. At no point was this fire-break closer than one mile to the city limits. It was cut four rods wide. On high land, a one-rod strip was cleared of stumps and plowed, while in the muskeg a ditch was dug along one side of the clearing to prevent its being crossed by peat fires.

Other than this principal fire-break, 19 miles of fire-line, connecting it with Rapid River to the southward, were constructed.

ADVANTAGE OF RADIATING FIRE-BREAKS OUTLINED.

Whenever possible, settlers were employed on the fire-break as laborers. This not only gave employment to settlers who had lost everything in the conflagration; it materially furthered the development of the country, since these fire-lines can be used as roads. Work on the fire-break afforded much-needed education in scientific fire protection, and was also a valuable exhibition of how cheaply clearing can be done when properly supervised. Of the $3,000.00 appropriated for the purpose, a total of $2,996.14 was expended. The project was carried on under the direction of the Forest Service and supervised by the local district ranger.

Existing conditions will in every case govern the cost of constructing a fire-break. Green timber can usually be cleared off more cheaply than fire-killed timber. A scattering stand of timber may be cleared at less cost than a thick stand; softwood more cheaply than hardwood. Clearing of stumps and plowing a rod-wide stripe in a four-rod fire-break on a ridge costs less per mile than digging a four-foot ditch in a four-rod fire-break in muskeg. Where a road, no matter how narrow, is so located that it can be widened out to the desired width for a fire-break, it can be more cheaply done than cutting the full width from an unbroken stand of timber. Streams, lakes, open fields, roads—all can and should be carefully considered as aids, in planning a fire-break, since by taking advantage of them an effective fire-break can often be constructed at less cost than would otherwise be the case.

The Baudette-Spooner fire-break was absolutely necessary, because of the dangerous condition in which the fires of 1910 left the forests, the dead trees being blown over and forming one continuous slash over large areas. Had it been made in 1909, there is no doubt but that a large proportion of the many lives and the millions of dollars' worth of property destroyed in 1910 would have been saved.

What may be done in preventing such a disaster, by a small village whose residents realize their danger from forest fires, is shown in the following account of a fire-break, constructed in 1911 by the village of Lengby, in southeastern Polk county.

THE LENGBY FIRE-BREAK IN POLK COUNTY.

The village of Lengby, Polk county, is just a mile north from the north line of the White Earth Indian reservation, and the forest, white and red pine, spruce, tamarack, mixed hardwoods and undergrowth, reaches up to and into the village limits.

In the fall of 1910, a forest fire, started somewhere on the reservation, and swept up towards Lengby from the south. (This, by the way, is a common occurrence in the fall.) The village was partly protected by Spring lake to the south and east and by the field to the westward. Between the western extremity of the lake and the field, however, stretched almost a mile of woods. Through these woods, if not checked, the fires would have raced and wiped out the village. Its sole chance for continued existence lay in the ability of the citizens to stop the fire, at the wagon trail, less than a rod wide, but extending from lake to field, as a primary, and Popple river, a narrow creek with tree-tops meeting above it, as a secondary line of defense.

Business operations were suspended, and the people of Lengby fought the fires along the narrow road for three weeks as they advanced and receded with shifting winds. At length the people won out, but they had three weeks of hard, desperate labor behind them, and were exhausted.

This story was told to the local forest ranger in 1911. He suggested to Mayor Lillo that to widen out the road between the lake and field, making it a fire-break, would be a cheap and effective labor. He showed that such a proceeding would give an opportunity for back-firing if necessary, and would also decrease the probability of a fire leaping from the south to the north side of the road. The suggestion embodied the following steps: To clear out all trees, brush, grass and combustible debris from each side of the wagon road to a distance of two rods, making an open, cleared strip of about five rods in width. Then in the fall of each year it could be made part of the road work to mow and burn all weeds and grass along the fire-break while it could be safely done. It was believed that this method would be effective, since the mowing and burning of weeds and grass would prevent a ground fire crossing the fire-break.

The lowest bid received was $75.00 for clearing a strip two rods wide on only one side of the road, or $150.00 for both sides. This sum loomed large before the council and board; the idea was very nearly abandoned.

At this point Mayor Lillo, believing that a narrowed fire-break would be better than none, suggested a compromise. He proposed that the fire-break be made only one rod wide on each side of the road; that men be hired on a basis of a daily wage to do the work, and agreed to personally oversee the work. The latter plan was agreed upon and the work was done.

The result is a fire-break almost three rods wide, extending through the woods between the natural guards of lake and field, east and west, for 288 rods. It lies a mile south from the village, closer than which it is not advisable to construct a village fire-break. This fire-break, even though narrower than was planned at its conception, will prove a great aid in protecting from forest fires the little village of 180 persons. Its total cost has been only $40.00. Only $40.00 and the gratuitous labor and thought of a public-spirited mayor! The good accomplished, in the event of a fire from the south, is very far in excess of what the actual expenditure would indicate.

AN OBJECT LESSON FOR OTHER MINNESOTA TOWNS.

There are many villages and cities in Northern Minnesota in like case with Lengby in respect to forest fires. They would all do well to profit by the example set by Lengby, even should the cost be greater. By taking advantage of the five-mill tax authorized in section 24 of the forest law, if the money is not otherwise available, there are very few places where funds sufficient for the purpose could not be raised, at small additional burden to the taxpayers. In planning a fire-break, the natural features which may be utilized to reduce the cost should be well considered; good work should always be done; if possible, the outside break should be made four rods wide, and never less than one mile from the city limits. The local forest officers should be consulted for advice; it will be helpful and they will gladly give it.

A good fire-break is excellent insurance!

CHAPTER VIII.

DISPOSAL OF SLASH.

A feature of fire protection work which is always in evidence is the question of the proper disposal of various kinds of slash, resulting from every sort of timber cutting operation. This confronted the Forest Service early in the summer; consequently, it will properly be touched upon at this point. A fuller discussion of slash disposal appears later in this report under "Winter Work," page 64.

The kinds of slash which required most attention in the summer were: The old logging slash, cut previous to the summer of 1911; logging slash created in the summer of 1911, and slash resulting from the clearing of different types of rights-of-way. The last was especially important. Right-of-way clearing is ordinarily carried on during the summer months, and is consequently taken up in more detail at this point than other forms of slash.

OLD SLASH, CUT PREVIOUS TO SUMMER OF 1911.

Under "General Organization" (page 14), it has been shown how those responsible for dangerous areas of old slash, cut before the summer of 1911, met the requirements of the service by putting on patrolmen paid by themselves. In but few cases, unless where it particularly menaced some building—school houses and settlers' places, for instance—was any further demand made as to the care for old slash.

SUMMER-CUT LOGGING SLASH ACCUMULATING IN 1911.

There were some few logging operations carried on in the state in the summer of 1911. In every case some measure calculated to annul the fire danger was required of the operators. The details varied in different places. To convey an idea of what steps were taken, we quote from the reports of the district rangers:

advisable that the state and counties conform to this requirement where they are constructing roads.

As we all know, it has been the practice to throw the tree-tops and brush into piles or windrows along the edge of the woods on both sides of the road. This has a doubly harmful effect. The brush when dry constitutes a fire trap in which a fire can quickly gain headway if any one passing by carelessly drops a lighted match or cigar butt. It also renders the road useless as a fire-break, since a hot fire so near the road is almost sure to jump across and, because of the added heat from the brush piles, it cannot be stopped at the road. A road should constitute one of the best possible places to stop a fire.

In any road which your county has under way or intends building, you should immediately provide for the burning of the brush and tree-tops where the road passes through wooded lands. The burning should be done by throwing the brush into the middle of the roadway and burning it in piles when conditions are such that the adjoining woods can be protected. Some one should be left to see that the fire does not spread, since the person or persons in charge of the work are liable for all damage caused by a fire which escapes. The disposal of brush is required by the forest law passed during the last session of the legislature (sections 15 and 16, chapter 125), which makes it the duty of the State Forester to prescribe the manner of disposing of all brush and slashings as a means of preventing forest fires. I consider this work of special importance. It is something perfectly feasible to carry out; it costs little and should have a very beneficial effect on the control of fires in your community. I hope that you will give this matter your personal thought and attention both as a county officer and as a citizen. The State Forest Service will keep in touch with and will appreciate your efforts in the carrying out of these instructions.

Very truly yours,

State Forester."

The conditions depicted above as having customarily accompanied road clearing, and the evils resulting therefrom, were common with them as well as in the clearing of all manner of rights-of-way. Rights-of-way for railroads (these had been doing better in late years, but many were still dilatory in the work), drainage ditches, and telephone lines, whether cleaned directly by owners or by contractors, were, of course, cleared of timber and brush. The resulting debris was then cast in windrows along the route, to dry and make a fire-trap of what should properly be a fire-break.

MOVEMENT TO HAVE RIGHT-OF-WAY SLASH BURNED.

To bring about the proper disposal of right-of-way slash was a consideration to which Forest Service officers paid much attention. They lost no time in urging its proper treatment, along the lines of the above letter, upon the individuals, corporations, or public officers, who could be fixed as responsible in any case.

County Commissioners and others directly in charge of or letting contracts for road-making were induced to either clear up the debris themselves, or place a "slash disposal" clause in contracts. One or the other has uniformly been done. In some instances, commissioners have withheld sufficient money to cover the disposal until the work was completed. The law is very plain on this point, and the advantages to be gained, not only in fire protection, but also in improving the appearance and utility of roads, are very obvious. Public officers, when the subject was properly presented to them, were usually anxious to take the necessary steps.

In all of the great drainage projects of Northern Minnesota, the large ditches for part of their length—and in some cases throughout—pass through timbered lands. A preliminary step to the dredging is the clearing of rights-of-way of all timber. Since, at least in the northwest, the dump from the ditch is graded down for highway use, the right-of-way must be cut much wider than otherwise. A large amount of brush results from clearing so wide a strip through timber than it is feasible to cover with the dump, unless in sink holes. Consequently, the surplus must be otherwise disposed of. It has been customary to cast it in windrows just outside the limits and leave it to rot or burn—an excellent starting point for forest fires. The clearing is usually done by small sub-contractors, each one taking care of a short stretch at a very small profit. The experience which the ranger in District 11, with headquarters at Thief River Falls, had in securing the disposal of the ditch slash is related here:

CLEARING RIGHT OF WAY FOR RAILROAD THROUGH DENSE TIMBER—SLASH BURNED CLEAN UNDER DIRECTION OF RANGER—PULP WOOD WILL BE HAULED OFF.
Minnesota Forest Service Photo.

DITCHING CONTRACTORS REQUIRED TO BURN THE SLASH.

The sub-contractors on a certain ditch were first approached. They showed clearly that their contracts stipulated nothing further than the cutting, and piling of the material along the right-of-way. One or two of them, of more public spirit than others, piled their brush and burned it of their free will. The majority, however, could not afford to do this. Consequently, it was necessary to go to the officers of the drainage company which held the entire contract for the construction of the ditch systems.

Here the ranger was told, at first, that in their belief the company was not required to burn the debris,—that contracts merely called for its removal from the right-of-way, which was being done by piling it at the side. The ranger took up the matter with the county attorney. An abstract covering ditching work was gotten out and read. In the engineer's specifications, a clause was found which required clearing, burning and removal of all brush or debris from the right-of-way without injury or damage to adjacent property. Thereupon the specific contract of the drainage company in question was read, the same clause being found and shown to the manager. The latter at once instituted burning work along the ditches, putting on a crew of men for the purpose. There having been a great deal of slash cut in the two seasons of work in that vicinity, it was not possible to clean it all up before snow same and buried it. The disposal will therefore be continued in the spring.

The clause in the engineer's specifications referred to above covers all drainage ditches in the state, whether purely state projects, or judicial ditches. It is necessary that all concerns digging ditches shall dispose of their brush in some safe manner. This is done under the direction of the district ranger. Ditch contractors who sub-let clearing contracts provide for the slash disposal being done by the sub-contractors in a manner satisfactory to the rangers.

The new law is explicit in regard to railroad rights-of-way, specifically in section 14, and in connection with other forms of rights-of-way in section 16. Portions of routes of many roads in the northern part of the state were found to be in need of cleaning up. The conferences which rangers were accustomed to hold with railway officials, which often were brought about through previous meetings between the State Forester and heads of different roads, did a great deal to instill the idea that these conditions should be bettered. The roads came to realize that their own interests, as well as the people's, would be furthered thereby. Accordingly, a great deal of railroad right-of-way cleaning up was done in 1911.

INDUCING TELEPHONE COMPANIES TO DO THEIR PART.

Section 16 of the new law applies to the clearing of telephone rights-of-way, as to those clearing highways or railroads. Lines are often built through forested districts where considerable cutting is necessitated. Oftentimes they are built parallel to roads previously cleaned up. The slash from the telephone routes, if piled in windrows and allowed to remain, counteracts the value of the clean roads as firebreaks and increases the fire danger. Telephone companies were therefore instructed to dispose of their clearing slash. They were shown that they would thus not only comply with the law, but that they would benefit themselves by the operations. Forest fires, or brush or grass fires, always damage to some extent and often ruin the stretches of telephone line in their paths. The companies realize that burning their slash, thus decreasing the likelihood of fires, will also decrease the likelihood of damage to their lines.

By inducing railroads, public officers and others who created slash in cutting rights-of-way, to dispose of it properly, the Forest Service not only did away with the very considerable fire danger which would otherwise have been caused by uncared for right-of-way slash but it established a precedent which should be valuable in later years. The examples set were of assistance in procuring the proper disposal of slash made by settlers. It was demonstrated to the latter that the larger interests, as well as themselves, will be made to comply with the forest law.

CO-OPERATION IS ESSENTIAL TO ALL.

The Forest Service realizes that if any results in forest preservation are to be secured in Minnesota it must have the good will and active support of everyone. A force of less than one hundred men—the approximate size of the Forest Service organization in 1911—cannot possibly through its own unaided efforts accomplish what must be done. To achieve success in any large degree, the service must be backed by the co-operation of all, whether individually or collectively, who are interested in the forests. This means everyone. There is no person in any walk of life who is uninfluenced by the forests. Far from being solely a source of revenue to lumbermen, which is the impression of many, they are a wonderful source of national wealth.

Knowing this, which should be, but has not been, a matter of popular consideration, the Forest Service was justified in urging the co-operation in fire protection of all residents or property owners in the forested region of Minnesota. The methods adopted to elicit this co-operation are taken up previously under the head of "Education" on page 24. Some of their effects are shown under the heads "Co-operation," below, and "Old and Summer Slash" on page 29. The patrolmen furnished by the different industries interested, and the efforts made by those who make slash to dispose of it properly, are direct results of the appeal made for active support. An apparent active willingness to assist the work of the Forest Service arose from a gradual strengthening of popular concern in forest welfare. This, though as yet somewhat intangible, is nevertheless in existence. In Minnesota, much of the apparent interest in forests may be accounted for by the fact that so many of her residents are of Scandinavian or German descent. For a great many years, the mother countries of these races have gone deeply into forestry as a science, and as a practical business proposition. They have made the conservative development of their forests pay large profits. Their people thoroughly realize the economic value of forests to themselves. Consequently, the Minnesotans of German and Scandinavian extraction are imbued with a respect and an inbred love of the forests. They understand, as the native born citizens are coming to understand, the necessity for careful preservation and utilization of our forest resources.

CHAPTER IX.

RAILROADS AND CO-OPERATION.

The railroads are a large factor in forest development, and have been in the past a large factor in forest destruction. As previously mentioned, railroad officials were met by forest officers and conferred with in regard to fire protection. The policy of the service in this regard has been to enforce the requirements of the law if its observance could not otherwise be secured. The former is occasionally necessary. However, a law, the observance of which must be forced, will ordinarily be obeyed only to its letter, then grudgingly, necessitating constant and usually unsatisfactory, often expensive, litigation. Therefore, while the Forest Service insisted that the law be observed, the first approaches to a railroad official who would have charge of desired improvements were made with instruction, and advice as to how the desired work should be done. The service men argued that the money outlay involved should not be charged on the "loss" side of the company's books, but rather should be included in "Cost of Maintenance," and as an investment to bring future revenue in the shape of freight from the timber saved. There were but few, if any, instances in which this course met with anything but a willing response. There were none which did not result in a greater respect for the aims, and a more substantial belief in the actual efforts, of the Forest Service. An evident intention on the part of the railroads to meet the requirements of the law, in spirit as well as letter, has become apparent. This, while previously not entirely lacking, had been quite effectually concealed. The advantage is obvious; a good law, observed in its spirit and in a measure voluntarily, is achieving its purpose in far higher degree than would the same law were its literal observance to be ground out step by step with frequent recourse to the courts. Hence, at the end of less than a year's endeavor, the work of the Forest Service in forest preservation, which from precedents set in previous years and in other states, might have expected opposition from them, is being accorded genuine co-operation by the railroads.

FIREBREAK PROTECTING SEED TREES AND YOUNG NORWAY PINE, ITASCA STATE PARK.
Minnesota Forest Service Photo.

Evidence of this, other than the establishment of patrols and the clearing up of right-of-way slash, are not wanting. While there is still a great deal to be accomplished in the construction of firebreaks outside the rights-of-way, yet, more money has been thus spent by the railroads during the past season, to better purpose, than in previous years. Reasons may be found in the new understanding among the roads that firebreak construction is a direct advantage to the companies, as well as a protection to owners of property adjoining the rights-of-way. In former years, the railroads have paid out immense sums of money annually in the settlement of claims for damages done by fires for which railroad locomotives were held to be responsible. Many such claims have been felt to be fraudulent, even though it has often been impossible to prove them so. At this point, it is felt that a co-related digression from the chief subject in hand is warranted.

ONE SERIOUS PROBLEM THE RAILROADS HAVE FACED.

In the development of Northern Minnesota, the railroads have been a prime factor. Without them, that immensely rich region would still be an almost uninhabited wilderness. The few residents would still be forced to pack in supplies; they would still be dependent upon small gardens, and upon trapping, hunting, and fishing, for sustenance. Its great commercial industries and fertile farms would be lacking without railroad transportation facilities. The progressive development of its various localities has been, and is, absolutely dependent upon the advent of railroads. Pioneer settlers always have, do today, and will, implore capital to construct railroads to their remote settlements. Only thus may the latter be brought to enrich their owners. The railroads are a means for inaugurating the development of the potential resources of the land, and of whatever natural wealth may exist upon or within it. True, the promoters of railways have been encouraged with extensive land grants, some deserved, others not. This latter has been the fault, largely, of the people, with whom the ultimate decision in such cases rests. They have permitted it in their overwhelming desire for railroad development at any cost. However, once any new region is opened by a railroad, the very people who besought its construction have been, and are, accustomed to fight it in every possible way. In forest and prairie regions one phase of popular antagonism is expressed in damage suits against the railroad, to recover the value of property destroyed by fires. In many cases these are just, and should be paid to the full worth of the harm done. If all suits of like nature were worthy, owners of property destroyed would in a majority of instances be promptly reimbursed for their losses. Unfortunately, there are people who, not satisfied with reasonable treatment, attempt to collect exhorbitant claims for fire damages. It is this deplorable practice which forces the railroad to retain attorneys to investigate and contest fire claims. Furthermore, it works hardship upon those whose claims are just and reasonable. It reacts upon the unjust claimants themselves, should they in future have reasonable demands. Even with attorneys to protect their stockholders, and eventually the public, who, through passenger and freight rates, supply the money to pay fire claims, cases are known where unjust claims have been paid by railroads.

PROTECTION DUE FROM UNJUST DAMAGE CLAIMS.

While in no manner does the Forest Service wish to see the railroads exempted from paying reasonable fire damage claims (in fact, quite the contrary), it intends to be impartial. Consequently, its policy considers that the railroads are as deserving of protection from unjust damage suits as the settlers are of protection from fire.

To revert to the subject, the Forest Service officers urged that firebreaks, constructed efficiently outside the rights-of-way, would not only protect the railroads in large measure from the payment of unfair damage suits, but would practically preclude all fire damage claims, through eliminating the fires. Such firebreaks, made either by railroad employes, or by the land owners who were paid for their labor by the roads, together with aid of patrolmen and clean rights-of-way, would be excellent evidence that the roads were doing everything possible to prevent fire.

As a result of service activity in this direction, most of the railroads undertook some firebreak construction in 1911. Altogether they spent a good deal of money. Especially was this true in those western regions where prairie and meadow fires, more dangerous in a wet fall than forest fires, commonly occur. There, some of the railroads included in their budgets a fund for firebreak construction. Upon being approached by forest officers on the subject, the right-of-way men on the western roads stated that they were ready to carry on this work and had done so in 1910. They said, however, that their work in 1910 had been opposed by settlers in many cases. Out there, plowing on high land, and mowing and burning on muskeg land, are the methods used in making firebreaks. It appeared upon inquiry that, owing to the urgent need for firebreaks in the extremely dry season of 1910, the railroads had resorted to somewhat

A PLOWED FIREBREAK THROUGH HARDWOOD TIMBER.
Minnesota Forest Service Photo.

drastic measures. They had let breaking contracts to outside people. The latter, desiring to fulfill their contracts only technically, did the plowing rapidly and with little care, leaving conditions which were of small benefit and which angered the settlers. A different method of procedure, which it was considered might have better results, was suggested to the railroad men. It was proposed that the railroads hire local men for the work, who would observe more care than outside contractors; that, in the event of any settler's not wishing to allow the railroad employes upon his land, he should be given the option of doing the work himself in a manner satisfactory to himself and to meet the idea of the forest officers. He should then be fairly reimbursed for his labor by the railroads. The suggestion was favorably received. It was further suggested to the railroad men that they should report any settler who refused either alternative. He would then be approached by a ranger and told as to the reasons justifying the firebreaks.

A LITTLE CAMPAIGN OF EDUCATION AMONG THE SETTLERS.

With the impartial attitude indicated above, the forest officers then visited a number of settlers along both roads in question to ascertain their attitude toward the new methods of firebreak construction. The majority were to some extent bitter against the railroads, for various reasons. They were commonly inclined to permit nothing of the nature on their lands. Statements like this were common: "I don't want my land all cut up in every direction. Anyhow, if the railroads sets any fire on my place, they-ll have to pay for it."

An effort was made in all such cases to show the settlers that their attitude was wrong and opposed to their own best interests, that where the railroads were willing to expend money in protecting the settlers and were willing to leave the mode of construction to the settlers and the ideas of the forest officers,—paying the settlers in fact to protect themselves,—the latter should be willing to do their share. It was shown how any settler who refused to co-operate in this would be suspected of ulterior motives and very closely watched. Explanation was made that the railroads would very likely fight to the limit any fire claim such a settler might present, with a fair chance of winning the case, because the refusal to co-operate would arouse suspicion in any jury. The opposite was also shown—that meeting the railroads half way in this good work would tend to give confidence in a settler, with a subsequent more liberal treatment.

The settlers were brought to see that the Forest Service maintained an impartial attitude, and wanted to see justice done them by the railroads and vice versa; that the service, in looking up the facts of any fire, would collect all evidence on both sides concerning its origin and the extent of damage done. It was explained that, while the service would not be a party in any civil suit, this information would be open to all. In the event of a fire destroying hay or other property of a settler, not only the origin of the fire would be ascertained, but also whether or not the hay or other property had been protected by reasonably good firebreaks. In the case of hay, the report would state whether it had been stacked at a distance from the railroad, out of reach, ordinarily, of sparks. Settlers were made to see that when damaged property had been protected by good firebreaks, the probability of reimbursement for the loss would be strengthened; that, in addition to this advantage, efficient firebreaks would be a real benefit to any fair-minded man, who would naturally prefer to retain his property intact, than to have it burned, with all the accompanying inconvenience and the uncertainty of receiving payment for his loss.

A PLAN THAT WAS UNCOMPLETED DURING 1911.

Generally speaking, advances made along these lines induced a better feeling among settlers toward the railroads on the firebreak question. The larger per cent of those approached finally expressed themselves as willing either to allow the railroads to work on their lands, provided that the methods adopted were those least detrimental to subsequent working of the land, or to the actual work themselves, to be paid by the railroads for their labor.

This plan to permit the construction of firebreaks without undue friction between the two parties directly concerned was not completely developed in 1911. It is felt, however, that a good beginning was made in the above and other similar instances, toward securing co-operation between these two mutually dependent, but often antagonistic, factors in the development of a new country—the settler and the railroad. Co-operation between the settler and the railroad, worked out along the lines of interlocking interest indicated above, and between them, individually and together, and the service, will do much to eradicate the fire evil, so far as they are concerned.

THE PROBLEM OF THE LOCOMOTIVE SPARK ARRESTER.

The law requires that all railroad locomotives shall be equipped with efficient spark arresters during the fire season. The problem of spark arresters has been a hard one to solve. The ordinary screen arresters, of a fine wire mesh, are ordinarily impractical. While in good condition, the screens will catch and hold most of the cinders, but they quickly plug up under a forced draught, so that firemen are placed under hardship in keeping up steam. Firemen have been known to punch holes in the screens, to make it possible to get up sufficient steam. Enginemen are prone to blame the spark arrester, without due investigation, for any difficulty that may arise in this connection. Furthermore, the wire screens become distorted, leaving large openings through which even live coals will pass. At least two roads in the state are working on a scheme for an efficient and practical spark arrester.

Even when good spark arresters may be installed on all engines, only one source of fire danger—the smokestack on locomotives,—will be eliminated. The other source, the ash-pan, is fully as dangerous as the stack, if it is not properly cared for. Railroads are taking steps to close the lateral apertures of ash-pans with screens, and flood them with injector overflow, so that they will be wet down regularly. This will cool the bars and prevent their becoming warped into larger openings, thus doing away with live coals being scattered along the track.

Whenever the ash-pans and smokestacks of all engines are prevented from discharging live coals, the necessity for a special corps of railroad patrolmen will practically disappear.

DUTY OF TRAINMEN IN REPORTING FOREST FIRES.

In that section of the Forest Law which applies to railroads, the provision is made that all trainmen shall watch for fires along or near the right-of-way. When any such fire is seen, they shall drop a message, describing its location and extent, to the first section foreman found, and at the first stop. It is the duty of the section men and the station agent to take steps for promptly extinguishing the fire. In the event of a large and dangerous fire, the railroad companies ordinarily send out a locomotive with additional help, and fire fighting equipment. In addition, the roadmasters get in touch with the district rangers or patrolmen. Every fire is carefully extinguished, no matter how small because any fire has possibilities of spreading. Section foremen, special patrolmen, or whoever may be in charge of the work, are instructed to see that work is not discontinued until every bit of fire is out or rendered harmless. The trainmen reporting a fire to the section men, who then take prompt steps to extinguish it, when systematically done, will work out very well in fire control. Ordinarily, of course, the special railroad patrolmen following day trains closely on speeders will catch small fires that locomotives set. In the event, however, of a large fire, started in some other manner, running near the right-of-way or sweeping in toward it, one patrolman would be powerless. Then, the trainmen can be of great assistance in notifying section men, and also, if the fire is very dangerous, can send a wire to the Chief Dispatcher. The latter can then take whatever additional steps such as sending out a locomotive and extra gang, may be necessary.

A BIT OF THE "TRUE BLUE" SPIRIT OF CO-OPERATION.

The railroads are beginning to evince a spirit of co-laboration with the Forest Service aside from what the law requires. It is evident in their willingness to honor the suggestions and demands of the latter relating to patrol, clearing rights-of-way, and construction of firebreaks. A more advanced and not so directly selfish co-operative tendency is exemplified in other ways. For instance, to obtain a crew of men quickly to fight a fire is the first necessity, and is often very difficult. Realizing this, a ranger inquired of an official of one of the larger railroad systems as to what the railroad would be willing to do in an emergency. An example was made on the supposition of a large fire, not caused by his road but one reached by its lines. (It is understood, of course, that a railroad shall in all cases take care of its own fires.) In such a case, the ranger inquired, how would a request from him to the road, for a crew of men with tools be received. The official replied that, where necessity arose for a crew of men on such a fire, reachable from the railroad, and where the men could be used to definite purpose, the road would be glad to send out any men available, such as an extra "gang" with an engine, to work on the fire while needed. This—and it was quite generally true of all roads—is real co-operation. It is of a sort especially valuable in a sparsely populated region, where it is almost impossible to collect a crew of men with any rapidity; and rapidity is highly important in fire control.

Furthermore, different roads have revealed a helpful inclination, by rendering assistance to the forest officers in little ways which cannot be construed as selfish—at any rate, no more so than that by aiding in the preservation of the forests they are aiding in preserving an important present and future source of traffic. Rangers have been allowed the use of railroad speeders and wires in case of fire or other emergency. At least one road has authorized its train crews to stop at any level place to pick up the local ranger.

Thus, a reasonably successful effort was made to induce the railroads, and the settlers whose lands abutt the railroad rights-of-way, to co-operate in fire protection. Similar effort was made by the Forest Service to secure the active interest of township, village, city and county organizations. Sections 19 and 24 of the Forest Law require that officers of municipalities shall co-operate with the service.

CHAPTER X.

INTEREST OF FIRE PROTECTION.

Section 24 of the Forest Law authorizes and directs all towns, villages and cities, and their officers, to take precautionary measures to prevent

CAMP FIRE IMPROPERLY MADE—SERIOUS DANGER FROM FIRE.
Minnesota Forest Service Photo.

the origin and spread of prairie and forest fires. Specifically, the officers of towns, villages and cities are required to do whatever may be necessary to protect the property of such municipalities from fire, and to extinguish the same. Such municipalities are also authorized to levy a tax of not more than five mills upon taxable property, to be known, when collected, as the "Fire Fund" and to be used in paying expenses necessary and incidental to the prevention and control of fires. The officers of towns and villages are further instructed, by section 24, to act, as far as possible, in co-operation with and under the general supervision of the rangers. Since all municipalities, and also counties, in the forest region are directly concerned in forest welfare, and since many villages and cities are exposed to forest, brush, or prairie fires, it is to their best interest to prevent and control them. Using these facts as a fulcrum, and sections 19 and 24 of the law as levers, the service has worked to secure the observance of sections 19 and 24 in the spirit as well as the letter of the law. Results were quite good in 1911. This is shown especially by the facts that counties and towns have taken steps to secure the cleaning of road slash, and that some villages and cities have at least begun the construction of firebreaks. These things reveal an awakened interest in forest matters, and are long strides in the right direction.

CAMP FIRE PROPERLY MADE IN A PREPARED SPOT.
Minnesota Forest Service Photo.

THE CAMPERS' ESPECIAL INTEREST IN FIRE PROTECTION.

Co-operation with the State Service by railroads, counties, townships, villages, cities and settlers, will be of great aid in eliminating the fire evils in the forests. These, with the lumbermen, are the principal fixed and directly concerned factors in the fire question. Added to them are the campers, hunters, fishermen, and pleasure seekers generally, whose number in the woods varies, and is increasing year by year. Such people should certainly realize the value of the forests. Without them, the game for which they seek would of necessity disappear, and many of the best streams and lakes where they fish would surely in course of time run dry. Unnecessary diminution of the forests is a calamity indeed to thousands of people who look to them for necessary and healthful recreation. Nevertheless, the latter have been, through lack of forethought, through carelessness, or purposely, the cause of innumerable forest fires. They have built camp-fires and, through neglect, allowed them to become forest fires. The hot embers from their pipes, cigars and cigarettes have been the origin of hundreds of fires disastrous to their own interests, destructive not only to the habitat of game, but destroying in their course thousands of game animals of all species. Hence, and because the state and national laws require it for the preservation of forests, hunters, fishermen, and other pleasure seekers should exercise the greatest care with respect to starting prairie, brush and forest fires.

With a view to impressing these facts, the service in 1911 posted notices in conspicuous places, warning all people who traverse the woods to be careful with fire. A copy of this notice is here reproduced.

HELP!

Preserve the Forests by Preventing Forest Fires. Let Everyone Help.

Settlers in particular are asked to assist in preventing fires in the woods. **Look out for the little fires** and those **smoldering** in the swamps; they may soon become **big** ones, and endanger your homes and property and those of your neighbors. Slashings should not be burned, except when it is impossible for fire to run in the woods or when enough help is at hand to make the burning safe. **Talk** this over **with** your local **ranger** and with your neighbor and get their assistance.

Campers and **hunters** cause many fires through **carelessness.** It is a poor woodsman who leaves a fire burning. Let each one act the part of an independent ranger and make the woods a safe place to be in. Clear a space for your **camp** fire. Build it away from stumps, logs, duff and peat. Make only a small fire. **Be sure it is out** when you leave. Put out any uncared-for fire you find, if you can. If you can't, notify a ranger, any public officer, or the owner of the land.

Even **young timber** has a **value** and it will soon be worth more. Every one of us loses money if the trees burn up before they are cut and put to use.

It pays to be careful. If you allow a fire to escape, you are liable for the damage it does, and to a fine and imprisonment. The state law in regard to forest fires is **strict** and it is the duty of every citizen to help the rangers **enforce** it. By doing so, you will be adding wealth to the state and making Minnesota a safe place to live in.

WILLIAM T. COX,
State Forester.

Another form of appeal, addressed especially to hunters, was printed on cards. Quantities of the latter were then sent to county auditors, who enclosed one with every hunter's license issued. The following is a copy of this "Appeal:"

PREVENT FOREST FIRES.

An Appeal to Sportsmen.

All sportsmen are interested in the protection of our forests. This could not be otherwise, since the forests constitute the natural home of all big game within the state. With the disappearance of the woods the game will disappear also. Many of our game fishes can live only in our wooded lakes and streams; the protection afforded by the forest and the character of run-off resulting from a forest cover appears essential to their existence and propagation.

The sportsman, before all others, appreciates the forest for its own sake. The lure of the woods is one of the greatest incentives to the camper, hunter or fisherman. Who would care to go on a lengthy canoe trip or camp in the northern wilderness were it not for the call of the woods?

The forests of this state have been steadily reduced in area and impoverished in character by fires, and this is an apepal to you to do all in your power to prevent forest fires by exercising care in camp and by putting out small fires when you find them.

Under the new forest law, any person leaving a fire unextinguished is liable for the damage it does and is subject to prosecution as well.

The state has over a hundred rangers and patrolmen on duty, but every sportsman should be a volunteer ranger and game warden and help protect the forests and the game.

WM. T. COX,
State Forester.

ONLY 12.1 PER CENT OF THE 1911 FOREST FIRES STARTED BY CAMPERS.

In addition to the printed warning notices by the service, its officers were accustomed to discuss the subject of fire prevention with any campers whom they met. Articles calling attention to the fire danger, addressed to sportsmen, were placed by rangers in various newspapers in the state. The appeals and warnings directed to sportsmen and campers generally were not without effect. Results are evident in the fact that, of the fires reported in 1911, only 12.1 per cent originated from camp-fires. It is probable that some of these were set by the campfires of berry pickers. The latter are a very important contributing agency in starting fires, because of the numbers which enter the woods in berry season.

To obtain active co-operation in fire prevention from dwellers in the forest region and from all who enter it for purposes of gain or recreation has been a desired result of all work done by the service in 1911. While the public has not been unconsidered, an effort has been made especially to secure the co-operation of those who live in, or are otherwise directly interested in the forests. This, because among them are found the chief agencies—many of which have been enumerated above—in causing fires. It is thought that if these, which have formerly contributed largely to the origin or to the spread of forest fires, can be brought, through perfected co-operation with each other and the Forest Service, to become active aids in their prevention and control, much of the enormous fire loss in the timber regions of Minnesota will be done away with.

CHAPTER XI.

PERMANENT IMPROVEMENTS.

To strengthen the efficiency of the small field force which it is possible for the service to maintain, it is necessary to construct artificial aids in fire protection, and to improve the natural and artificial means of travel and communication. The former include lookout towers of wood and steel on sites which command an extended view, for the purpose of quickly locating fires while small; and cabins at strategic points for the storing of tools and as temporary shelter for rangers and patrolmen. In the means of travel and communication are included railroads, wagon roads, trails and water routes; the mails, telegraph and telephone. Trails, and portages on canoe routes, were not available where they would be of great advantage, or else they were often in a condition which retarded rapid travel. Telephone lines, of the greatest value in the quick control of fires, did not exist in many of the wilder localities where disastrous fires are common.

CONSTRUCTION OF THE LOOKOUT TOWERS AND CABINS ESSENTIAL.

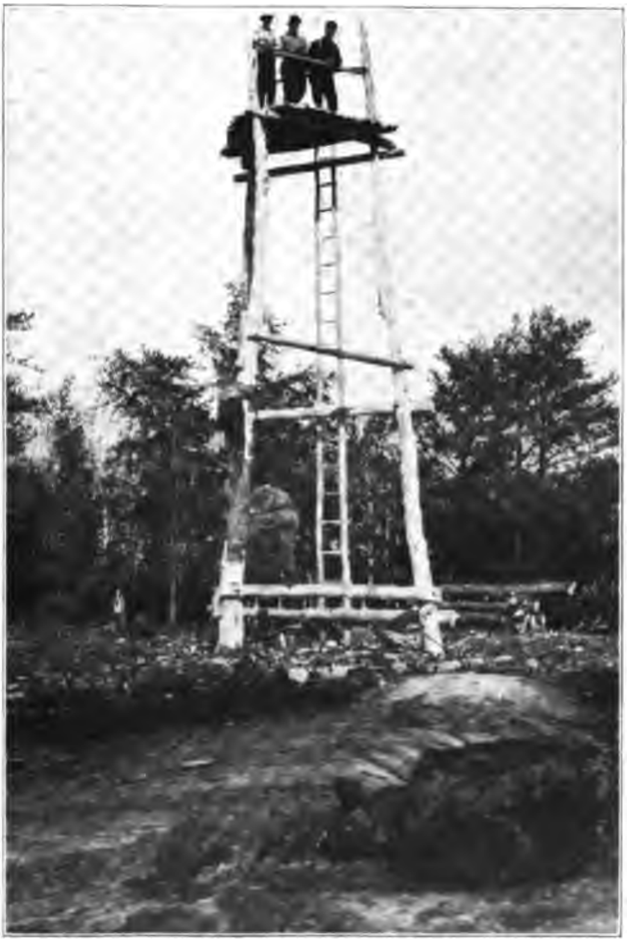
To get to and extinguish a fire as soon as possible after it is started is of the first importance in the control of forest fires. Obviously, therefore, a patrolman should be apprised of any fires while they are small. Forest officers in their travels, walk or ride through the woods, or paddle a canoe upon streams whose banks may be walls of timber. To them a smoke ("smokes" are the tell-tale evidence of fires for which patrolmen must watch) only a short distance away may be invisible while small, and until the fire acquires large proportions. Consequently, there must be many places along patrol routes where a patrolman or ranger may get above the trees and other view-obstructing features of the landscape, thus obtaining an unimpeded survey of the region for miles around. He is then in a position to locate the presence of any unusual smoke, and can hasten to in-

CANOE ROUTES PROVIDE MEANS FOR RAPID TRANSPORTATION THROUGH THE WOODS.

Minnesota Forest Service Photo.

vestigate its cause. With a realization of the necessity for "lookouts," every patrolman and ranger, in his early trips through the territory assigned to him, searched for points where lookout stations would be of value. Usually they chose high, bare hills. In the selection, the men took into consideration the relation of one hill to another, with respect to intervening distances and extent of country which each commanded.

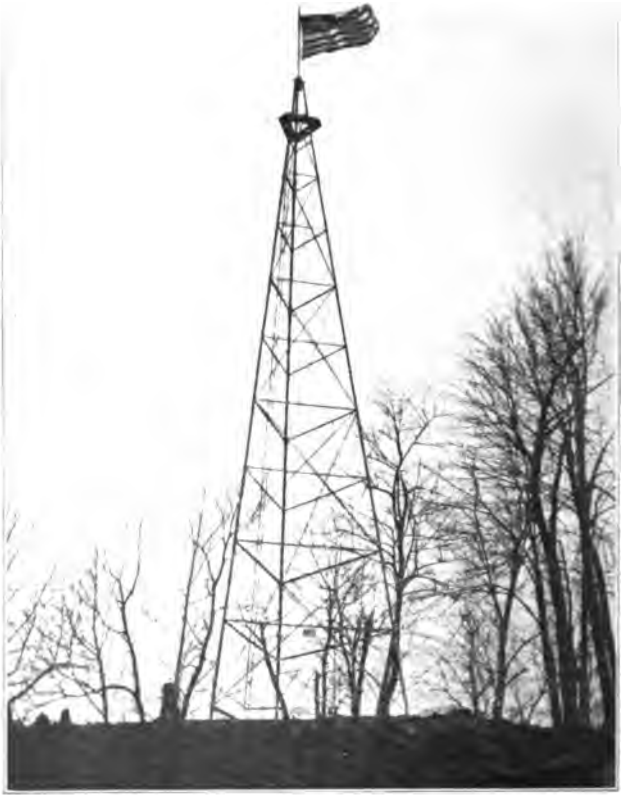
Another consideration in picking a lookout site is its location with respect to roads, canoe routes, trails, and telephone lines. Where it was found advisable to place a lookout station at some distance from any existing means of rapid travel or communication, trails were cut from the latter to the lookout. Some of the sites selected in 1911 were on state land. Where they were on private lands, arrangements were made either by purchase or long time lease whereby the state obtained control of them.



WOODEN TOWERS BUILT FOR USE IN LOOKING FOR FOREST FIRES.
Minnesota Forest Service Photo.

TREES, WATER TANKS, WINDMILLS AND HIGH BUILDINGS AS LOOKOUT STATIONS.

Many of the chosen sites were such that natural or existing conditions sufficed as lookout points. In some, a tree taller than the surrounding trees was trimmed of branches in its top, and answered the purpose. Oftentimes it was necessary to build a crude ladder to facilitate climbing. Railroad water tanks, elevators, municipal water tanks, high buildings, and windmills, were used wherever possible, thus affording good lookout points. There were not enough of these, however, to constitute a complete system of lookouts. On many of the best hills the use of trees was not feasible, or other essentials were wanting. Hence it became necessary to erect towers with ladders and platforms. Varying conditions necessitated towers of different heights and modes of structure. For example, a bare hill-top which rises above the surrounding forests required only a low, simply built wooden tower 15 or 20 feet high, constructed at very small expense. On



MINNESOTA FOREST SERVICE STEEL TOWER AT GULL LAKE, ERECTED AUGUST 25, 1911. COST $36.30.

Minnesota Forest Service Photo.

uniformly tall, it was necessary to put up a steel or wooden tower 80 feet or more in height, at a correspondingly greater expense than the other. Con- the other hand, in a flatter country, where the timber is quite dense and tracts for building some of the wooden towers were let to settlers on whose lands they were to stand. Others were erected by forest officers when their duties permitted. Where steel towers were used, they were purchased knocked down, hauled to the site, and in many cases set up by patrolmen during damp weather. All brush, timber and other combustible debris on the tower sites was safely disposed of, in order that the towers might not be destroyed by fire, and a view left unobstructed. Towers were labeled as having been built by and belonging to the State Forest Service. Wooden towers have been whitewashed to prevent their rapid decay, and also to make them more readily observed by settlers and others who might be expected to use them to locate fire.

The tower which appears in the accompanying illustration is of steel, and was erected on a hill near Gull Lake, west of Brainerd, in District No. 4, under the direction of Ranger J. P. Saunders, of Brainerd.

Another tower, which was erected on the Kawishiwi River in the Superior National Forest by Ranger Chappell, in co-operation with Supervisor J. A. Fitzwater, is illustrated here.

PATROLMEN AND RANGERS BUILD CABINS FOR USE OF SERVICE.

Fires are of frequent occurrence in remote places, to which it would require considerable time to transport fire fighting tools from the nearest settlements. It was necessary, therefore, to build cabins as storehouess and bases of supply. These were especially needed in regions where the cabins of homesteaders are infrequent. A number of cabins were built close to lookout towers, thus increasing the usefulness of both. Cabins were provided with locks, and notices placed on them stating that they were state property. All cabins were erected by rangers and patrolmen, who worked on them at such times as their duties would allow. They cost from $10.00 to $21.00 each. In addition to those erected by the service, a number of vacant cabins were found at advantageous points.

Three hundred dollars was allotted to each of the twenty district rangers for use in cabin and lookout tower construction in their districts. The number of towers and cabins upon which money was expended is given here, with the total expenditure for 1911:

Wooden towers, 92; steel towers, 13; cabins, 8; total cost, $3,587.52.

A number of towers and cabins were built at no expense to the service, other than the time of the patrolmen.

Not all of the towers and cabins found necessary and planned in 1911 are yet built, because of lack of time. The work will be continued in 1912.

TRAILS AND PORTAGES CUT BY PATROLMEN DURING 1911.

Of equal importance with the discovery of fires while they are incipient, is rapidity in getting to and extinguishing them. Much of the forest area of Minnesota is still a wilderness, untraversed by roads. The only means of entering these wilds are by trails and water courses. The pleasure seeker, the cruiser, the forest officer or fire fighter, who travels through them, must either walk, packing his duffle on his back, or resort to the canoe.

Disastrous fires often rage in these remote districts; the difficulty of reaching them is a great obstacle in fire prevention and control. Because many of the wilderness trails, and the portages along the canoe routes, have been used only by the occasional cruiser, trapper, camper or Indian, they are often grown up to underbrush; progress along them is impeded by fallen trees and other debris, and their beginnings are hidden from view. Travel in the woods, arduous at the best, is made more so by these conditions.

To facilitate travel here, the field force of the service in 1911 began to clear out trails and portages, shorten the old and cut new ones. This work was largely carried on by patrolmen at such times as they were not busy at patroling, fire fighting, tower building and other work. Although the task was not completed in 1911, a good beginning was made.

The work on clearing out old and cutting new trails is of much importance. The trails themselves constitute lines of defense in fighting fire, and rapid means of escape for endangered settlers. Furthermore, and of value to the people at large, improved trails and portages will mean much to those who look to the forests as a place for recreation, in that the improvements will eliminate much of the arduous labor which ordinarily attends excursions into the woods. This fact should attract more people than formerly to the wilds of Minnesota for pleasure. Thus, the trail work is of direct value to the Forest Service, and valuable in no small degree to all who go into the woods.

TELEPHONES TO PLAY A GREAT PART IN FOREST FIRE PROTECTION.

The lookout towers which have been and will be built make it possible to locate fires while small. The existing travel routes and those to be built offer means of quick access to the fires for the men who locate them and for crews of fire fighters. There is still another agency, which, wherever available, contributes to the quick and sure putting out of fires, namely, the telephone. In the ideal arrangement, every lookout tower should be connected by telephone with the others. Thus, with three towers located at the vertices of a triangle, two of them, for example, situated ten miles north and ten miles west respectively from the third one, the exact location of each being known, and all connected by telephone—should the man on the third tower locate a fire a certain number of degrees to the northwestward, at an uncertain distance, he could call the lookouts at the other towers and ascertain the angles at which the fire was situated with respect to them. Knowing these angles and the distances and directions of the two towers from his own, he could quickly figure out almost the exact location of the fire, and thus select the route by which he could most quickly reach the scene. Thereby he would be at work extinguishing the fire in the shortest possible time from the moment of its discovery. That is of the highest importance in handling forest fires. This is but one of the many possible instances which might be cited of the value of telephones in fire protection.

Liberal use of available telephone facilities was made by the Forest Service. One of the first steps taken by every district ranger was to approach local telephone officials to see what might be done toward securing rates on existing lines and the co-operative construction of new ones. It was impossible to obtain rates because of an impression that the anti-pass law prohibited it. When toll lines were used by the service (rangers were instructed to make free use of phones), full charges were exacted.

A STATE LAW HANDICAPS CONSTRUCTION OF TELEPHONE LINES.

Agreements were made with many companies by rangers tending toward the co-operative construction of new lines where their existence would be of material benefit to the service. In the majority of these cases, there was some question as to legality because the companies with whom they were made operated toll lines. Apparently the only instance in which the state can co-operate in the construction of a telephone line is with non-commercial companies. These instances are rare; consequently, the state must either do without 'phone service, pay costly toll charges, or erect lines at its own expenses in localities where, with co-operation possible under the law, good lines might be constructed, and used by the state permanently at a comparatively small cost.

Because of this obstacle, very little telephone construction was possible in 1911. Sufficient funds were not available to permit the construction by the service of any lines which would have been of value, entirely at its own expense. The only instance where the service co-operated in the actual construction of a settlers' line was in District No. 6. Here, 4½ miles of line were built in co-operation with the Farmers' Telephone Company, of Deer River, at a cost to the service of $90.00. This line connects with a lookout tower in a commanding location and should be of much value in fire protection. In addition to this, a great deal of preliminary work has been done, tending to the construction of better lines.

Had greater funds been available for use by the service in the "permanent improvement" work, much more might have been done in tower, cabin and telephone construction, and improving routes of travel. In that case, the service would have been in better shape to handle a possible bad fire season in 1912. As it is, a great deal was accomplished in the aggregate, and the work will be continued in 1912 and thereafter.

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CHAPTER XII.

RECONNAISSANCE SURVEY.

Another phase of the Forest Service field operations in 1911, accompanying the direct work of fire prevention and control, was the beginning of a reconnaissance survey of the forest region of the state. The two principal items of this work were: (a) Timber and soil typing, and (b) mapping.

TIMBER AND SOIL TYPING.

In spite of the fact that many hesitate to admit it, there are many areas in Northern Minnesota where the soil is unquestionably useless for agricultural purposes, but these same lands, devoted to timber production, will yield good returns. In addition, there are lands which may eventually be used for farming, but for the present are most profitable in forest. These areas have all originally been forested. At present many of them, through the action of fire or the operations of lumbermen, or both, are denuded. On practically all areas, a young growth of timber is springing up. A few of them have been so consistently fire-ravaged that they are now destitute of all tree growth. All these areas of forest land, and other areas where better soil conditions obtain, but where no farming will be done for several years to come, should of right be kept producing timber.

The first step in putting these cut-over areas in a productive condition is to ascertain their location and extent, whether on private, state or government lands, and the timber conditions existing thereon. It was and will be possible for the field force, rangers and patrolmen, to determine in the course of their regular work the general location of many of these areas. Information thus procured is necessarily only general. It is planned to maintain crews the coming season to obtain more specific details regarding these forest lands, so that the conditions of the various tracts may be understood and treated to the best advantage. Such information will be collected and compiled as rapidly as funds will permit.

During the latter part of November and December, 1911, two men were in the field north of Red Lake. They were investigating soil and timber conditions in an immense, almost uninhabited portion, of Beltrami and Roseau counties. While there is no doubt that most of the land in that region is agricultural, it is believed that certain portions of it should be devoted to growing timber. These portions are the ridges, or "islands," of sand and gravel, which arise from that flat country, being beaches left by the receding waters of Lake Agassiz. The report of the party will show the character of the soil in these islands, and especially of the so-called "Beltrami Island." It will also deal with general vegetation, and conditions of the timber, including present stands, traces of past stands, and prospects for future growth. It is expected that the report will confirm the belief that these islands will be more profitably devoted to forests than field crops, and at greater benefit to the people who will occupy that district.

MAPPING THE SURVEY.

Only inadequate maps were available at the start, so that it has been found necessary for the Forest Service to do a good deal of mapping. The patrolmen, both federal and state, worked on these maps in 1911, and will continue to do so in 1912. Blank township plats are used, upon which is noted any data which is not available from original government plats, the location of trails, canoe routes and portages, roads of every kind, drainage ditches lookout towers and cabins, areas of non-agricultural soil, and timber conditions. The work is cumulative, the plats being turned over by patrolmen to their ranger, who forwards them, together with those made by himself, to headquarters for checking and compilation. The plats are then returned to the ranger, with check notes and criticisms, for the addition of further information. A large map of the state, showing the hardwood, the coniferous, and the prairie regions of the state, has been prepared. A copy of this appears on page 8 of this report. This map has been compiled from inadequate data. It will be checked up the coming season by a study of the western and southwestern boundaries of the forests.

SAND, ROCKS AND STUMPS REMAINING WHERE FIRE HAS RUN THROUGH REPEATEDLY.
Minnesota Forest Service Photo.

CHAPTER XIII.

FIRE FIGHTING.

Because of its fundamental importance, the first care of the Forest Service field force was the prevention and control of fires. Especially was it the duty of both state and federal patrolmen to cover their beats regularly, watching the operations of settlers and timber cutters, and warning them of the necessity of clearing up their slash and other inflammable debris. At times when the actual danger of fires was not imminent, they were employed on other work related to fire protection. The auxiliary shifting force of private patrolmen directed their efforts solely toward the prevention and extinguishment of forest and prairie fires, their activities being confined to the property of the concerns who employed them.

Fortunately for the new service, the season of 1911, especially the latter part of summer and the fall, was one of more than normal precipitation, so that the immediate fire risk was not great for any extended period. However, without the frequent rains, the summer would have been an extremely dangerous fire season. A chief source of danger was the widespread occurrence of large areas of blown down timber, fire-killed in 1910. These "blowdowns" are tangled masses of dead soft and hardwood, impossible to penetrate and veritable fire-traps. The dry needles remained on the windfalls, greatly increasing the ease with which fire would catch and spread. The inflammable nature of the windfall areas, together with their extent, was known to the field force and necessitated a constant watchfulness. A dry spell of one or two days or longer justified the presence of the force, because small fires with their possibility of increase were then very frequent. In more than one instance a fire became of considerable size before it could be controlled. A case in point is the fire which occurred near Kinmount, in District 15, on July 10. A rainless period of several days had offset the effect of previous wet weather. A spark from a locomotive caught in a rotten log; a wind fanned it to flame and spread the fire rapidly over the adjacent territory, which was a fire-trap of blown-down timber such as is described above. The railroad company was notified and responded with a special engine and thirty men. This crew worked on the fire four days, finally corralling it on the 14th. Other fires were discovered and controlled during the same period.

Again, in the fall constant care was necessary. The rains of the summer, possibly assisted by the energy stored up during the drouth of 1910, resulted in an unusually rank growth of all sorts of vegetation—grass, weeds and underbrush. Early frosts, followed by a period of "Indian summer," contributed to render this heavy weed crop a serious menace. The danger of fierce grass fires was constant until the coming of snow, because one dry, windy day sufficed to render inflammable the dead vegetation. Many grass fires which were very difficult to control did occur. Had it not been for the rains which prevented the timber from igniting easily, the toll of damage from fires in 1911 would no doubt have been greater than it is.

FIELD FORCE SETS EXAMPLES AND IMPROVES WORKING SCHEMES.

That there were no extended drouths, permitted of more thorough work along other lines than would have been done with a drier year, when more time would necessarily have been devoted to actual patroling against the occurrence of fires. It was possible for the field force to accomplish a great deal in creating a better understanding of service work and in enlisting popular support. Tower and cabin building and trail cutting received much attention. Time was also given to establishing co-operative working schemes with various concerns—telephone companies, railroads, newspapers, lumber companies and others interested in the work of fire prevention and control. In some instances, where villages were in danger from fire, fire-breaks were constructed about them. In these undertakings, especially in those pertaining to fire protection, the force of patrolmen retained under the agreement with and paid by the Federal Forest Service were of much assistance.

Three classes of fires were encountered in Minnesota in 1911. They were: (a) Timber, (b) meadow and prairie, and (c) peat fires.

TIMBER FIRES.

Timber fires were in but few cases so large that more than ten men were required to control them. Those which did occur originated from careless burning of brush, from campers' fires and from fire thrown out by railroad engines. During dry periods there were a few really large fires, in addition to the Kinmount fire, mentioned previously. One of the larger fires, near Orr, in District 16, was only extinguished after more than two hundred men had been summoned to fight it.

MEADOW AND PRAIRIE FIRES.

Meadow and prairie fires were the cause of much anxiety in the fall because of the season's unusually rank growth of vegetation, which was killed by early frosts. Many such fires were caused by settlers in burning firebreaks, by trappers and others who wished to remove the grass crop, and some by unknown agencies. They were in themselves very fierce and difficult to control, running as they do rapidly before high winds. Fortunately, the woods were kept damp in the fall, and did not readily ignite from the prairie fires which swept into them.

PEAT FIRES.

Peat fires, the third class encountered in 1911, are always a direct result of either timber or grass fires, coupled with a dry condition of the peat itself. Running fires catch in dry logs, hay-stacks, sides of hummocks left by former peat fires, or other heat-retaining agencies, which carry the fire into the peat beneath. The peat fires occurring in 1911 were usually those

PEAT BOG FIRES BURN WINTER AS WELL AS SUMMER—THEY MUST BE DUG OUT.

Minnesota Forest Service Photo.

which had started from spring fires and had been allowed to burn by a careless people. Several such fires were controlled in 1911 under the direction of the service, one of them costing more than $1,800.00. (Additional account of this fire follows, under the heading "Beltrami Peat Fire.") The usual and most effective method of checking their spread is to ditch around the burning peat areas, removing all the peat in the ditch down to the loam or clay soil. If watched to prevent the fire from jumping, such a ditch will prevent the lateral spread of a peat fire.

THE BELTRAMI PEAT FIRE.

(The following report is from Percy C. Records, Ranger in District No. 11.)

In the summer of 1909, two drainage ditches, one-half mile apart and extending east and west, were dug through a large area of wet peat bog, the eastern edge of which is one mile west of the village of Beltrami, in Polk county.

These ditches, coupled with the extreme drouth of 1910, resulted in so completely draining the bog that it became a dry and combustible peat prairie. Cracks several inches in width and to the depth of the peat, caused by its shrinkage, extended in many directions. Action of winds on the sides of these cracks removed from them all traces of moisture. Consequently, when, in the spring of 1911 and after the frost was out of the ground, a grass fire swept over the surface, it ignited the peat in many places. The fires thus started in the peat were confined to the S½ N½, section 7, S½ section 7, N½ section 18, in township 147, range 46, and to the N½ section 13, township 146, range 47.

As is always true when surface fires ignite peat, these fires were at first very small. At that time they could have been cheaply dug out. However, the land was owned by four non-residents and was not watched; hence the fires were for some time allowed to spread unchecked. At length one of the owners was notified of conditions, and sent a man to investigate them. He reported that heavy rains, occurring just before he came, had extinguished the fires, and left.

Had this man known that water, short of an actual flood, will not quench peat fires once well under headway, the fires might have been stopped even at that time at a less expense than later. The fact is, the fires were not put out by the rain, and continued their course as before. They burned even more fiercely, because the rain had made the surface of the peat more compact, hence better fuel.

OWNER OFFERS CONTRACTOR $1,500.00 TO STOP PEAT FIRE ON HIS LAND.

Until August no further attention was given to the action of the fires. Then, however, they had spread to such an alarming extent that the owner previously mentioned was strongly advised by the First State Bank of Beltrami to attend to them. Acting upon this advice, he offered the job of controlling the fires on his land to a local contractor, the consideration for the work to be $1,500.00 The contractor considered the amount too small, since the fires were scattered and burning over approximately 230 acres. The owner referred to, then notified the State Forester of the fires, which lay outside the organized patrol area of the state. Immediately, on September 4th, the ranger from the nearest district was sent to investigate conditions at Beltrami.

In the meantime, the owner had perfected a deal with the contractor. Under it the latter was, on a daily salary of $10.00, and with full power to act, to do what he could to prevent further spread of the fires, on the former's land. This plan did not consider the fires on adjoining land, which menaced a large area of peat to the westward. On this account, a co-operative agreement was made between the contractor and the state ranger on behalf of the remaining three owners. Under it all the fires were corralled as rapidly as possible. A special state patrolman was placed on the work to supervise that part of it done on the lands other than those in charge of the contractor, and to advise with him. Data as to distances, areas and costs were collected by the patrolman, who remained "on the job" until October 19th, when the fires were under control. The three non-resident owners, aside from the first-mentioned, were notified of conditions, and each agreed to pay for the necessary work on his land.

POWER DITCHING MACHINE BROUGHT IN TO FACILITATE WORK.

Because of the already large extent of some of the fires and their constant increase, rapidity in corralling them was imperative. Laborers were scarce and it was impossible to obtain a large crew at once. Consequently, a power ditcher, known as a "bull" ditcher, was obtained to aid in the work. A bull ditcher is drawn by a cable attached to two capstans revolved by horse power. The bull ditcher was to do the work on a basis of 75c per rod. Because more of such ditching was done than was originally bargained for, the latter part of it was done for 65c per rod. This work was begun on September 11th and completed on September 23d. In that length of time, a total of 973 rods of ditch was dug—an average of 88½ rods per day. The ditch was 3 feet deep, 5 feet wide on top and 20 inches wide at the bottom.

Because of the unwieldiness of the ditcher, to follow the fire line very closely was impossible. What little unburned peat remained inside the ditch was allowed to burn off where it would. As a matter of fact, one of the worst immediate results of a bog fire is that it usually leaves some unburned portions, too small to be of value, standing like islands. These render working the ground with machinery practically impossible.

Three main bodies of fire, as indicated on the map, were enclosed by the bull ditcher. The costs, average and total, of the work done by the machine, are considered in the cost summary shown later on in this report.

HAND DITCHING FOUND NECESSARY IN SMALL BURNING AREAS.

Other than the three large bodies of fire enclosed by the bull ditcher, there were many burning areas too small for advantageous work with it. The majority of them were so far removed from each other and the big fires that the land to be saved by so doing justified their being trenched around by hand.

Work began on September 7th with six men, aside from the contractor. The amount under "supervision" in the cost summary to follow is the total of what the contractor received.

From September 7th until October 7th, when the trenching was practically completed, the trenching crew ranged from four to nine men, as they came and went. The dimensions of the ditches dug varied from 4 feet in depth and 20 inches in width to 6 inches in depth and 20 inches in width. The average depth was 18 inches and width 20 inches. The average length of ditch dug by one man per hour was 11 feet. A total of 897 rods of ditch was thus constructed.

Where small areas of unburned peat remained inside the ditches they were allowed to burn up to the latter, but were guarded that the fire might not cross them. This was done also in the case of the large machine-enclosed fires.

The costs, average and total, of the work done with shovels are considered in the cost summary which follows.

PATROLING WHEN PEAT PRAIRIE IS DRY AND COMBUSTIBLE.

The work of controlling these fires was done in the season when the rank grass on the peat prairie was becoming dry and combustible. It was complicated by the danger of prairie fires escaping from the original peat fires, and, in their course over the dry, unburned peat area, starting new fires in them. This danger was constant before the ditches were drawn around the fires. Thereafter it was in evidence on dry, windy days when sparks might be blown across the ditches into the grass. On windy dry days there was always danger of burning particles of peat being blown against the outside walls of the ditches, lodging on, igniting them, and spreading. That danger was especially great when the fires inside burned outward to the ditches. To guard against these dangers, men to patrol the fires and ditches were required from the outset. That the menace might be decreased, the patrolmen were instructed to adopt the following precautionary measures:

1. As rapidly as possible, the unburned grass inside the ditches was to be burned off.
2. As the peat fires reached the ditches from the inside they were to be shoveled back.

To decrease the length of time for which a patrol force should be required, the patrolmen were instructed to apply fire to the inside walls of the ditches, thus hastening the time when they should be entirely consumed and no longer dangerous. Care was required in the backfiring, but it proved to be an effective step.

The number of men required on patrol work varied from one on rainy days to four on dry, windy days. After the hand trenching was completed, October 7th, three men were retained as patrolmen. They also trenched around three small fires which were discovered after that date. One of these men was released October 27th, the work being so far along that only two were necessary.

COST SUMMARY.

The following table shows the money expended on the work described above, and the results obtained with the labor for which it paid.

Bull ditching: Total cost, $681.75; total distance dug rods, 973; cost per rod, $0.693; total acres encl., 223; cost per acre, encl., $3.057.

Hand trenching: Total cost, $352.08; total rods, 897; cost per rod, $0.394; total acres encl., 13.6; cost per acre encl., $26.03.

Patroling: Total cost, $390.50; total rods, 1,870; cost per rod, $0.208; total encl. acres patroled, 236.6; average cost per encl. acre, $1.65.

Supervision: $400.00.

Grand totals: Total cost of fire, $1,824.33; total rods ditch dug, 1,870; average cost per rod of total cost, $0.975; total acres encl., 236.6; average cost per encl. acre of total cost, $7.71; average cost per acre of 4 sections menaced, $0.712; forest officer's labor and expenses, $178.07; tools, $1.90.

DEDUCTION FROM COST SUMMARY.

1. A comparison of the cost per rod of bull ditching and that of hand ditching, $0.693 and $0.394, respectively, shows the former to be the more expensive form of controlling a peat fire. However, since only a small crew of men was to be obtained, and since the fires were rapidly increasing in extent, the greater rapidity with which the bull ditcher worked as compared to a small crew was the reason for its use. Moreover, at the time the bull ditcher was working on big fires, all the men available were at work on the small ones. Had not the bull ditcher been used, the large fires, ere they could have been controlled, would have burned over enough more land to more than discount the difference between the cost of its work and the cost of the same amount done by hand. Furthermore, these ditches, of uniform size, and joining as they do, the large drainage ditch along the section line, will aid in draining the land should it again become flooded.

2. The cost of the work per acre of the area enclosed by the ditches appears high. That enclosed by the hand dug ditches seems especially so. However, the cost of the ditching per enclosed acre should not be taken as a criterion of the value of the work. The work was not done for the sake of the land already burned over. It was done to prevent the spread of the fires, for the sake of the four sections and more of unburned peat into which the fires were eating. Therefore, the value of the work should be judged by the $0.713 per acre, which is the cost per acre of controlling the fires, and considering the four sections of valuable land which were directly menaced.

3. Had these fires been taken in hand immediately after the grass fires swept over the peat prairie, practically all of the $1,824.33 total cost could have been saved. Also, the 236.6 acres, total peat land burned over, could have been rescued from serious injury.. This is true because individual peat fires, if taken a very short time after their incipiency, may often be dug out with one shovelful and removed to a safe place in some receptacle. Every hour's delay means additional expense, and more valuable peat soil destroyed.

4. The start of the peat fires could have been prevented had the dry grass on the bog been burned very early in the spring, when the peat was still frozen and non-combustible. Such a procedure would not only have prevented fires getting into the peat in the spring by removing their cause before the effect could occur, but it would also decrease the probability of peat fires becoming started in the fall, should a grass fire then sweep across the bog.

5. The surest method of preventing the occurrence of peat fires is for an owner to make a fire-break around his land every fall until he has it worked down so that fires will not catch in it. These should not be made by plowing, because when the sod cover is turned under, and the peat exposed to action of sun and wind, it dries out rapidly. Over this dried out surface fires will run quite freely. The proper method of making a fire-break around peat land, or around stacks or buildings on peat land, is as follows: In the early fall or late summer when grass growth has ceased, and while the standing grass is still green, cut a strip of grass completely

around the property to be protected, whether it is peat land, stacks or buildings. Allow this cut grass to dry in the swath. Then on some quiet evening, just before the dew appears, burn it. Sufficient aid should be at hand to insure against the fire's spread, even though the standing grass is green. As soon as the grass is burned, the strip should be patroled to make certain that no fires have been started in the peat. Such a fire-break should be at least four rods wide, and will reduce to a minimum the probability of a grass fire doing any damage to property so protected.

CONCLUSIONS.

The extreme drouth of 1910, coupled with the extensive drainage schemes now being perfected in Northern Minnesota, has effected the drying out of immense, originally wet or "floating," peat bog areas. Dry, these peat bogs are combustible. If not protected in some such manner as is advised herein, they are almost certain to catch fire in the spring or fall, when grass fires sweep over the country. Then if the peat fires are not promptly looked after, the result will be an expensive fight to control them, or a tremendous loss of fertile soil.

For a man to allow the peat on his land to be consumed is folly, because in many localities the peat overlies soil and subsoil which is clay, sand or rock, as the case may be. When the peat, which is fertile (being especially rich in nitrogen and in lime from the calcareous remains of water animals), is consumed, the result is often an ash-covered area of poor soil, sour clog or rocks. Where the peat alone, or in connection with a subsoil of clay or loam, is worked down, the heaviest kinds of crops are produced. Some people may believe that the ashes contain much fertility. True, they do, at first, but even then it is counteracted by the lye content. But they do not contain as much as the peat originally contained, because much of the fertility has been wasted in the burning. Moreover, if the ash-covered land is not tilled soon after the peat is burned, the fertility in the ashes quickly leaches down through the soil, or is carried off by the action of water, and is lost. It should be remembered that a foot of peat overlying clay or loam soil is equivalent to a rich dressing of manure.

One feature of the fight to control the peat fires at Beltrami was the work done on fires which were allowed by township officers of town 146, range 46, to get into the bed of the road along the ditch between sections 7 and 18. This road is shown on the map accompanying the report.

The township officers, at the time when the peat fires first began to burn, should have taken immediate steps to control them, in accordance with section 24 of the forest law of 1911. It appears, upon investigation, that they did not know it was their duty. This aside, they should at least have prevented the fires eating into the main highway, which is directly under their supervision, and should have instructed the owners of the burning land to remove the public menace.

The road mentioned is a grade composed of the dump from the state ditch, and extending along its north side. The road is, of course, composed largely of peat, because the ditch was dug through peat. Only a small percentage of clay appears in the grade between sections 7 and 18, where the peat was deep. What clay there is, coming from the bottom of the ditch, appears on the top of the grade. Hence, the fires working down burned into, and under, the grade, undermining it in places.

No attention was given to these fires burning in the road. They might have done more damage had not work been started on the larger fires on adjoining lands. On October 7th, when the trenching around these fires was practically completed, those men released from that work were hired by the township road overseer. The fires burning in the dump were dug out, and a trench a little over half a mile in length (the full length of the main body of fire north of the road) was made along the road, between it and the burning peat.

This work was paid for by the township, and cost a total of approximately $250.00. This expense, or most of it, was needless, had the proper precautions been taken in time.

There yet remains the task of filling in those holes made in the side of the grade by digging out the fire, which will cost approximately another $50.00.

For this needless expense of $300.00, forced upon the township by the neglect of the officers whose duty it is to attend to such matters, those officers should be held responsible.

THIS WAS A WAGON ROAD BEFORE THE FIRE WENT THROUGH.
Minnesota Forest Service Photo.

END OF FIRE SEASON NOT REACHED UNTIL NOVEMBER.

By the first of November, 1911, the end of the fire season had arrived Consequently, six of the original twenty ranger districts, in three of which there is but little or no necessity for a field force during the winter, were closed, and their combined areas divided among the remaining districts. Thus, the forest area was divided into fourteen districts. By November 11th, many members of the summer force of patrolmen and a few of the rangers either had been laid off duty indefinitely, or furloughed for a certain length of time. Reports indicated that private operations in the woods would be numerous and extended during the coming winter. It was evident to the forester that more men would have to be retained on the field force for the winter than had been planned. Because of this, a circular letter, under date of November 11th, was sent to the rangers by the Forester, instructing them to retrench in expenditures by discontinuing the work of the summer. The latter included most of the operations which previously have been described under the heading "Summer Work," such as tower building, trail cutting and reconnaissance. This letter, and others, directed that the efforts of the rangers, and of the assistants who remained with some of them, should therefore be largely concentrated on the chief

COMING BACK FROM A FOREST FIRE.

Minnesota Forest Service Photo.

work for the winter; namely, in securing the proper disposal of slash resulting from the various timber cutting operations.

CHAPTER XIV.

WINTER WORK.

In former years and wherever timber has been cut for market, the brush and debris resulting from the cutting operations, technically known as "slash," has been one of the greatest contributing agencies to the origin and spread of forest fires. The presence in the forest of great areas of brush and other logging debris, distributed helter-skelter over the ground, dead, dried out by action of sun and wind, so as to be highly inflammable save when recently soaked by rain, has been a constant and terrible menace to all timber yet uncut. It has offered a constant and, because of the great lumbering operations of the past, widely extended invitation to human and natural causes of forest fires. Lying as it has, in great continuous bodies of fuel, slash has many times been touched off by lightning striking dry snags. Loggers, careless of results, have purposely set fire to the encumbering and unsightly expanses of brush in the spring when the logging season had closed. True, they have advanced the plausible excuse that this was done to prevent its becoming more dangerous later. Unfortunately, however, they have often selected unfavorable days for their firing, and, with insufficient force at hand to control the burning, the flames have escaped into adjoining forests, to damage them in greater or less degree. Other accessories to the ignition of slash have been campers, careless of their fires, who have departed leaving them unattended and still burning, to creep and smoulder, until, caught by a wind, sparks or embers have been hurled broadcast in the brush to become a general conflagration. Thus, with these mentioned agencies and others, has slash been an origin of forest fires.

As a factor in the spread of forest fires, slash has been perhaps the greatest single element of danger in the forests. In its combustible condition, and because the practice of timber cutting has been such as to remove practically all timber, exposed to the force of the winds, a slash fire once started advances and increases in width with awful rapidity. Increase in size of a forest fire always means corresponding increase in impetus. Consequently, a fire, from whatever ultimate source, which sweeps across a brush-strewn, tree-denuded area, is possessed of sufficient momentum to drive the flames into and through whatever green timber may stand in its path. Taking these things into consideration, together with the immense extent of the various branches of woods operations which create slash, it is readily understood that it has been the pre-eminent fire danger.

LOGGING SLASH A NEGLECTED MENACE FOR MANY YEARS

The menace of uncared for logging slash has been realized for a number of years. However, until a comparatively recent date, practically no attempt has been made to do away with it as such. For this there are a number of reasons. Chief among them have been the low value of stumpage, and the fact that the forests of Minnesota and of the United States have been considered inexhaustible until within a few years past. Consequently, lumbermen have considered it cheaper to accept what losses they might incur through fire destruction of timber, and to buy new stumpage, than to expend money in preserving the timber they owned. In fact, until the sale price of standing timber equals the cost of production, we cannot afford to spend much money in protecting it. This point has been reached in Minnesota for some species. It will not be reached for all species until the profits of the forest products middleman are eliminated. Conditions in industrial development are so changing that this must come eventually. Because the people did not realize that the forests were diminishing in extent until lately, no outcry was made against this form of policy. They continued, by impractical systems of timber laws and taxation, to force the lumbermen to cut the forests as rapidly as possible. They continued to pay the gradually increasing cost of forest products. It remained for the destruction of Hinckley and similar succeeding calamities, and the sharply advanced prices of forest products, to arouse popular protest in Minnesota and the United States as a whole against the occurrence of forest fires—primary cause of the one and a chief cause of the other.

HINCKLEY FIRE IN 1894 THE BEGINNING OF AN AWAKENING.

This sentiment against forest fires has been of very slow growth in volume since it was first aroused by the Hinckley fire in 1894. At that time it was more or less localized and vague, without definite purpose. It resulted, however, in the enactment of a bill in the legislature of 1894-1895, called the "Forest Preservation Act," in effect April 18, 1895. By its provisions, the state auditor was made Forestry Commissioner, with an executive agent, called the Chief Fire Warden. Forestry had not as yet become a recognized profession in the country. For that reason, very little precedent was to be found for the formation of that act, which consequently was not so complete as might have been desired. No special state funds were appropriated until several years later. Neither was there any attempt in that act to effect the disposal of slash. But, however, in the report of the Chief Fire Warden for 1895, it is recorded that early in the summer of that year, the township officers, who were by the act constituted fire wardens, sent in complaints that logging slash was a great danger in forest fires. That was really the first definite intimation that slash was considered a fire danger. During the year, the Chief Fire Warden, General C. C. Andrews, sent lists of inquiries to various lumbermen in the state concerning the general conditions of lumbering. In these lists because of the complaints above mentioned, he incorporated the following question:

"If you consider it practicable to burn the tree branches and tops, what is the best method of doing so?"

The answers received from the representative lumbermen to whom it was put were varied. The majority indicated a realization that slash was a menace to standing timber. Some, from men prominent then and today in the lumber business, flatly stated that the plan was impracticable. One considered the disposal of slash as practicable, but impractical. Others considered the idea a good one, but thought that conditions, principally the cost which burning the slash would entail, in comparison with the then low value of stumpage, would render it impractical to burn the brush. Still others offered suggestions as to methods of disposing of slash, most of which advocated clean burning by running fires at a time when the danger to standing timber would be the least. Today that plan is not considered in any good forest policy. Only two of the answers to the above question sent in 1895 bore suggestions which hold good today. The one of these suggested, in effect, that fire-breaks be made around the slash area, thus rendering it less dangerous. That plan is followed today, but only under certain conditions. The other suggested that the brush be piled and burned as cutting proceeded. The latter was the best plan carried in any answer received, and was far in advance of the ordinary views of that day. Speaking generally, it is the best scheme for slash disposal that can be adopted now. But, of course, it could not be applied in certain classes of timber.

BURNING AS REQUIRED BY LAW OF 1909 NOT SATISFACTORY.

The usual attitude of lumbermen in 1895, and for many years thereafter, was that, while they realized the menace of slash as a fire danger, any effective plan of removing that menace would entail an expense which lumbering conditions would not justify nor bear. As a result of this attitude, no definite attempt was made in the state to secure slash disposal until in 1903. In that year, General C. C. Andrews advocated the passage of a very radical act in the legislature, which required the disposal of slash. Opposition was so strong that the bill was killed. However, after the Chisholm disaster of 1908, a bill relative to slash disposal was introduced in the legislature and passed. It required the piling and burning of all slash resulting from wood cutting operations. Burning was to be completed as soon as conditions would permit, and before the first of May. This law was observed to some extent, but due to lack of funds available for use by the Forestry Commissioner, it could not be thoroughly enforced. Without an adequate force of men in the field, it was impossible to secure proper observance of this law, because in general the attitude of lumbermen in regard to slash disposal had not been materially altered since 1895. Consequently, they evaded the law insofar as possible. In itself, this law of 1909 was not practical, because, in one sweeping, hard-and-fast regulation, it required the handling by a single method—complete burning—of all the widely diverse slash conditions which obtain in Minnesota. The law of 1909 remained in effect for two years, or until the approval on April 1?, 1911, of the present forest law.

HOW THE NEW FOREST LAW IS REGULATING SLASH DISPOSAL.

The new forest law, now in effect, is very broad in its requirements for slash disposal, so that under it the proper disposal of all forms of dangerous slash may be secured. It considers in a general way the diverse slash conditions which prevail in Minnesota. The law is especially strong in this, because conditions are so varied that they could not practically be treated under set regulation. Consequently, the precise method to be followed in disposing of any given area of slash is left to the decision of the Forest Service officers.

Section 15, of the new law, which pertains to slash disposal, is herewith quoted:

"Section 15. Where and whenever in the judgment of the State Forester there is or may be danger of starting and spreading of fires from slashings and debris from the cutting of timber of any kind for any purpose, the State

Forester will notify the individual, firm or corporation, by whom the said timber has been or is being cut, ordering them to dispose of the slashings and debris as he may direct. Where conditions do not permit the burning of the slashings and debris over the entire area so covered, the State Forester may require the person, firm or corporation by whom the timber was cut, to dispose of such slashings and debris in such a way as to establish a safe fire line around the area requiring such protection, the said fire line to be of a width and of a character satisfactory to the State Forester.

"When any person, firm or corporation shall have been notified by the State Forester to dispose of slashings and debris, either by entirely consuming the same or establishing a fire line sufficient for the protection of adjoining property, and fails to comply with such instructions, the said person, firm or corporation shall be punished by a fine of not less than $50.00 and not exceeding $100.00 and costs of prosecution for each violation thereof or failure to comply therewith.

"When any such branches, slashings or debris are left unburned contrary to the instructions of the State Forester, the State Forester may go upon the premises with such force of men as may be necessary, and burn such branches, slashings and debris, and the expense thereof shall be a lien upon the land on which they are situated, enforced as liens for the improvement of real estate are enforced, and such expense shall be a prima facie valid claim that may be collected from the person, firm or corporation who cut the timber or wood from which the said slashings and debris were made."

WHY ADEQUATE SLASH DISPOSAL LAW HAS BEEN NEEDED.

The object of slash disposal is to eliminate the fire danger. The methods adopted have a three-fold purpose: (1) To remove the immediate fire danger; (2) to prevent injury to standing timber remaining on the cutover area or adjacent to it; and (3) on land which is not to be used for agriculture, to prevent the clean burning over of the land, thus preserving the young growth, the tree seed already on the ground, and the ground cover and soil itself.

In carrying out these principles, therefore, the rangers are authorized to devise and adopt those methods which are, in their discretion and from their personal knowledge of individual cases, the most economical and effective. Having determined the method to be followed in each case, the ranger issues a "Notice to dispose of slash and debris," retaining a duplicate of the same, to the responsible individual or corporation. A copy of this "notice" follows:

MINNESOTA FOREST SERVICE.

Office of the Forester, St. Paul.

Notice to Dispose of Slash and Debris.

....................................191..

To..

(Name)

....

(Place)

Under the State Forest Law, slash and debris resulting from timber cutting must be disposed of in accordance with the directions of the State Forester. This authority is conferred on the District Rangers acting for the Forester.

(See sections 15 and 16, chapter 125, Laws of 1911, on back of this form)

Since slash and debris left on..

....

....

....

constitutes or will constitute a menace to adjoining property, you are hereby notified to dispose of it as follows:

....

....

....

....

This work must be satisfactorily completed..........................

....

(When)

....

Ranger.

Rangers will make and retain a carbon copy of each notice issued.

DISPOSING OF THE DIFFERENT KINDS OF SLASH.

As indicated, slash conditions are so varied as to require an equal number of separate methods of slash disposal. Thus, softwood slash on agricultural land requires one mode of treatment; softwood slash on non-agricultural land another. Slash along railroad rights-of-way is often of such a nature that it must be treated in a different manner from that along drainage ditches. Slash conditions along two separate railroads may differ. Cedar and spruce slash must be disposed of in a manner entirely unlike that applied to pine slash. This diversity is endless over a wide range of conditions, and with different mixtures of timber.

It is already being proven that this policy of leaving the exact method of disposing of any given area of dangerous slash to the decision of the district rangers is effective. Of course, since the attempt to actually enforce slash disposal regulations is new in Minnesota, and since the attitude of lumbermen has previously been one of opposition to such regulations, some difficulty is encountered. Taking these two facts into consideration, the efforts of the service are meeting with really strong success. As time advances, and timber operators begin to realize that the Forest Service is working for rather than against their interests—incidentally to broader results desired—opposition is gradually disappearing. That co-operation of lumbermen with the service, which is necessary to the best mutual benefit of both, is becoming evident. In each case, a ranger has endeavored to devise the most economical plan for disposal, which at the same time will secure the desired result. In some instances, winter burning has been found to be impracticable. There, the requirements made were that as much of the brush as was required to be burned should be piled as cutting proceeded, and then burned before some specified date in the spring. On the other hand, in many instances, especially where an almost pure stand of Norway pine is being cut, burning as cutting proceeds is practicable, and is being carried out as the most practical plan. In some cases where this is being done, the operators find that the cost per thousand feet of getting out the timber is thereby actually being cheapened. This, which on the surface may seem to be unreasonable, is explained by the fact that the cost of skidding logs, when the brush has been burned, is decreased by the greater facility and speed with which the logs can be gotten out, unimpeded by the slash. The latter, if unburned ahead of the skidders, must often be handled twice or three times on the same area. It is this sort of thing, together with the persistence of the rangers and their assistants, which is bringing success in the enforcement of slash disposal.

DEALING WITH OBSTINATE CONTRACTING OPERATORS, A TASK.

One of the most serious obstacles encountered by the Forest Service in securing slash disposal, and which became apparent early in the season, was the refusal of different contracting operators to meet requirements. They accounted for their attitude on the ground that no provisions relative to brush disposal had been made in their contracts with owners. This difficulty was removed by many timber owners, who placed clauses in cutting contracts requiring the contractors to dispose of the brush in accordance with the service regulations. To insure observance of slash burning clauses, timber owners will in some cases reserve a sum, before final settlement with the contractors, sufficient to cover the cost of slash disposal. This sum is not to be given the contractors until proper disposition has been made of the slash. Where outstanding contracts do not include such a clause, the timber owners, as parties of the first part in the contracts, can be held to dispose of the slash.

Section 15, paragraph 2, of the forest law, provides that any person, firm or corporation, which shall have been notified to dispose of slashings by some prescribed method, and fails to comply with instructions, shall be deemed guilty of a misdemeanor, punishable by a fine of not less than $50.00 and not more than $100.00 and cost. The third paragraph of section 15 provides that in any such instance of non-observance of instructions the Servxice may go upon the land in question and properly dispose of the debris. The costs of any such procedure shall be a lien upon the land or other property of the owner or operator. It is hoped that instances where the instructions of rangers are not observed, where legal proceedings will have to be instituted, and where the service will be forced to exercise its prerogative of burning the slashings, will be very few in number. The service will prosecute any operator failing to comply with the instructions of a ranger. Some instances have arisen where it has been necessary to do so. In a majority of cases, however, the steps required are being taken. Where spring burning is most feasible, the rangers are keeping a check on the operators, to see that they shape their work with a view to complying with instructions.

MEETING OF DISTRICT RANGERS AT BEMIDJI.

On January 3, 1912, a convention of all district rangers was held at Bemidji. At this meeting the work of 1911 was gone over in detail, and that for 1912 discussed and outlined. Because of its contemporary importance, the slash question was the chief topic discussed. It was considered thoroughly in all its phases. Each ranger gave his opinions on the matter, and gave his reasons for requirements made in dealing with specific conditions in his district. These requirements, because of varying conditions, differed in the different districts, and were based upon a few broad rules, as follows:

"(1) Where trees are scattered, or the country is generally very rough and rocky, clean burning is inadvisable. In such cases, a fire line of at least 150 feet in width should be burned around each area of slash, and along rights-of-way." This rule is based upon the theory that where the trees are widely scattered their brush will not constitute a serious fire danger. Clean burning would entail a needless expense upon operators. The second part of this rule is based upon the theory that the rocky country would be non-agricultural, hence, forest land. Clean burning would effect to a greater or less extent the destruction of what meager ground cover is usually found in such rocky country, and, in some cases the soil itself, of valuable reproduction and any timber that might remain, and of seeds which have fallen to the ground. To reduce this destruction to a minimum is one of the fundamental principles upon which slash disposal is carried out. Hence the rule. Another point to be considered here is that the unburned brush retards evaporation of soil moisture. Also, in decaying, the debris adds to the valuable humus. Where slash from a thick stand of timber, even if on non-agricultural land and surrounded by a firebreak, will in future be a menace to adjoining green timber not to be cut, this rule is often extended to include clean burning. The latter is usually required to be done as cutting proceeds, in order that damage to the soil, young timber, and seed, may be avoided so far as possible.

(2) A corollary to the above rule is: "In cases where clean burning is not required, in addition to a firebreak of not less than 150 feet in width, to be burned around such an area of slash, a strip not less than 150 feet wide should be burned along each side of any form of right-of-way traversing the slash area. This general rule applies specifically to logging railroads in all locations, and will be of value not only in connection with clean rights-of-way, decreasing the danger of fire being set by locomotives, but in order that the strips may serve as lines of defense in fighting fires.

(3) "Where the land being cut over is to be cleared and used at once for agriculture, piling and clean burning is advisable." Clean burning will ordinarily be done in any event on such lands. It is best that it be done under supervision of forest officers and at a specified time. This is advisable because many forest fires have originated from the burning of brush on farm lands at wrong times.

SLASHINGS PROPERLY PILED FOR BURNING.

Minnesota Forest Service Photo.

(4) "Where operators have been permitted to postpone burning until spring, when the snow is going or gone, times should be selected for burning when the fire will not run freely on the ground. A sufficient force of men should be on hand to surely prevent fires escaping." The selection of times for burning when the fire will not run on the ground has a dual purpose. It is this: When fire will run on the ground the danger of its escaping is increased. Furthermore, running fires are ruinous to any valuable reproduction which may exist, of any seed which may lie on the ground, and to the ground cover itself.

(5) "In piling brush for burning, care should be taken not to make piles in close proximity to any green timber, old or young, which may have been left standing. This will prevent the injury of the trees when the brush is burned. The rule should be especially observed in regard to mature trees which have been left standing to secure re-seeding. Equal care should be taken in regard to young timber left standing on forest ground.

(6) "Whenever circumstances will permit, required burning should be done during the winter, as cutting proceeds." This, because winter burning as cutting proceeds insures the proper disposal of the slash, and leaves no opportunity for the operator to neglect the work. Furthermore, it is usually the cheapest method of securing effective disposal. Also, when a large area of slash is left unburned until spring, there is always a chance that the snow will disappear rapidly and be followed by a dry period. Thus, unless the work of burning is begun as soon as conditions will permit and diligently pushed, serious danger of fires escaping will obtrude. Accordingly, the work of burning may then in some cases have to be discontinued before completion. Hence, dangerous areas of slash may exist in the fire season which would not occur had the slash in question been burned closely behind the cutting.

The six rules in the above series apply particularly to pine slash. Rules 4 and 5 apply to any form of slash which is to be burned. The rules to follow apply in each case especially to the types and species named therein:

(7) "Where cutting operations are being carried on in spruce or cedar timber, the branches should be lopped separately from the unused tops, (Picture of lopping or burning showing young stuff)....................
so that every one lies flat on the ground." One reason for this method of procedure is that these species grow largely in swamps, ordinarily more moist than the uplands; hence, decay there is more rapid. The branches lying on the ground are uniformly damp in summer. They are not so pitchy, and rot more quickly than pine, and are therefore not so dangerous. If the large tops commonly to be found in spruce and cedar cutting, held high from the ground by their branches, are left intact, they dry out, remain for years, and fire will sweep through them readily. Usually, in spruce and cedar forests there are large numbers of young, healthy trees, too small to be merchantable, which often stand very closely together after the larger timber has been removed. It is the policy of the Service to protect such young valuable timber. Piling and burning of the brush could not, in the majority of swamps, be carried on without serious injury to it. Furthermore, if burning were required, and was not done in the winter, there would be a probability of the fires getting into combustible peat soil on which spruce and cedar often grow. Other things being equal, another reason why lopping is more advisable than burning in the treatment of these forms of slash (even on spruce on high land) is that piling and burning is relatively more expensive than in pine timber. The reason is that there is a greater proportion of branches in comparison to merchantable timber resulting from operations in spruce and cedar than in pine. Hence, it is cheaper to merely lop the branches than to lop, pile and burn. The

relative efficiency of two possible methods of disposing of a given area of slash being equal, it is the policy of the Service to require the use of cheaper method. Since lopping in these species (spruce and cedar) is as effective in removing the fire danger as is piling and burning, and since other considerations render lopping the more advisable, the latter is the method usually required. A very considerable obstacle in the way of securing proper lopping is the fact that much of the spruce pulpwood, and cedar tie, post and pole operations, are carried on upon a piece-work basis; that is, laborers are paid a flat rate per cord in pulpwood, and per piece in the cedar operations. They pay their own board, furnish their own tools, and are at liberty to do as much, and to a certain extent, as little work in a day as they wish. Consequently, any work which tends to cut down the number of cords or pieces which a piece-worker can turn out in a day, and for which he is not especially paid, is avoided wherever possible. Heretofore, no provision has been made to allow of paying piece-workers for lopping. Until some method is evolved by which this obstacle can be overcome, such as increasing the rates paid per piece, it is a difficult matter to secure thorough observance of the lopping requirements. In the meantime, it has in some instances been found necessary to allow operators to

VALUABLE HARDWOODS REMAINING AFTER LOGGING PINE, EAST OF RED LAKE.

Minnesota Forest Service Photo.

construct a safe fire-break, not less than 150 feet in width, around the cutting areas and along rights-of-way. Since the slash disposal law is now generally understood, every operator should make provision for handling this situation next winter.

(8) "Hardwood slash should be disposed of by lopping as cutting proceeds, or by the burning of adequate firebreaks around the areas of slash." The hardwood forests of Minnesota grow on land that is good for farming, unless too rocky. Therefore, the slash resulting from cutting operations will in a majority of cases be burned sooner or later, to put the land in shape for tilling. The above rule is devised to prevent the escape of fire from burning brush and to preserve remaining timber.

RANGERS USING JUDGMENT IN ORDERING SLASH DISPOSAL.

The foregoing rules are generally applicable throughout the state for the various conditions cited. In devising a method for the treatment of any individual area of slash, the broad rule which most nearly applies must be modified to meet the particular conditions of that area. This lies in the discretion of the ranger in whose district the slash is located. This is comparable to the discretionary powers of deputy fire marshals in the inspection and condemnation of buildings. A few of the slash problems encountered by rangers, together with methods devised for their treatment, follow:

No. 1. Problem: Pine Timber on Non-agricultural Soil.

Treatment: Ranger Chappell—Extracts from annual report:

"Type of slash—coniferous. Slash previous to this winter completely disposed of. Burning present slash as operations proceed except on one section where timber was so scattered that burning was considered unnecessary. Land, non-agricultural."

"Type of slash—coniferous. Slash made this winter is being burned as operations proceed at Camp No. 1. At Camp No. 4 on Basswood Lake, have required fire line and no burning; timber at this cutting is very scattered. Land, rocky and non-agricultural. Notice issued covering cutting at Camp No. 1 required burning to commence January 1, 1912."

The slash, where heavy, in the above instances, would endanger remaining timber. Hence, it was required, wherever conditions would permit, to be burned as cutting proceeded.

Ranger Thornton—Extract from annual report:

"The........................Company, making pine slash adjoining valuable timber which is not to be cut this winter, instructed to pile and burn all slash as cutting proceeds. Are complying with requirements."

Under "Problem No. 1" are examples of the specific application of "General Slash Disposal Rule" No. 1.

WOODED BLUFF IN SOUTHEASTERN MINNESOTA.

Minnesota Forest Service Photo.

No. 2. Problem: Where Clean Burning of Pine Slash on Non-agricultural Land is Not Required.

Treatment: For example of what is done in such a case, refer to the third example under Problem No. 1, above, ". . . .At Camp No. 4 on Basswood Lake, have required fire line and no burning; timber at this cutting is very scattered. Land, rocky and non-agricultural."

No. 3. Problem: Slash from Pine Timber on Agricultural Land.

Treatment: Ranger Eisenach—Extract from annual report:

"At camp of..................Lumber Company, S. 35, T. 45, R. 23, to cut 3,000,000 feet; 80 per cent white pine, 20 per cent tamarack, spruce, balsam. Burn all pine and birch slash; lop all other kinds of slash. Time limit (for completion of slash disposal), May 1, 1912. Excellent results so far; burning as cutting proceeds." This method of treatment is generally adopted for Problem No. 3.

Problem No. 3 is an example of specific application of "General Slash Disposal Rule" No. 3.

No. 4. Problem. Where Cutting Operations are Being Carried on in Spruce or Cedar Timber.

Treatment: (Cedar is usually found in swamps, spruce on both swamps and high land.)

Ranger Vibert—Extract from annual report: Cedar, spruce and tamarack:

"Instructed all contractors to pile and burn a firebreak 200 feet wide adjoining railroad rights-of-way, county roads and other roads, and where the slash would be dangerous to adjoining property."

The best method, for reasons stated in the explanation of "General Slash Disposal Rule" No. 7, above, for disposal of these forms of slash, is lopping. As stated in that explanation, it is difficult to enforce lopping because the cutting is done by piece workers, who are not paid sufficiently at present to do the lopping adequately. The fire-break plan is adopted as a safeguard against fires wherever thorough lopping is not done.

Ranger Linder—Extract from annual report:

"A. No corporations operating in District No. 12.

"B. The conditions met with in cases of homesteaders and settlers in this district are as follows: In a majority of cases they are small operators, cutting a little timber to live on and pay for clearing land for farming. The timber is mostly cedar, tamarack, spruce and poplar. In nearly every case they have been notified to lop the tops from every tree cut down. In some instances, where the slash constitutes a menace to adjoining property, they have been notified to pile and burn as cutting proceeds. The same kinds of timber are being cut by larger operators, and notices are the same."

Ranger Winslow—Extract from annual report:

"Cedar in very wet swamp ordered lopped."

Under "Problem No. 4" are examples of the specific application of "General Slash Disposal Rule" No. 7.

No. 5. Problem: Hardwood Slash. (Ordinarily, hardwood grows on agricultural soil.)

Treatment: Ranger Thornton—Extract from annual report:

"The..................Woodenware Company are the only hardwood operators in my district. I have instructed them to burn safe fire lines around and through the cutting. They have agreed to do so."

The "Problems" just exemplified, with some of the methods devised for their treatment, together with others, constitute the important question of slash disposal. Slash is being created this winter in upwards of 1,500 separate camps in the forests of Minnesota. To enforce the proper disposal of that immense amount of slash is the immediate duty of the Forest Service field force.

THE DIVERSITY OF TIMBER CONDITIONS CALLS FOR CAREFUL PLANS OF SLASH DISPOSAL.

It is highly important that the slash disposal work of the first season shall be carried out quite completely. We cannot expect, however, that the lumbermen are going to handle the slash problem in an entirely satisfactory manner, until they thoroughly understand that it is a real and intricate problem, which has entered into the logging business to stay. Men must be trained into the work just as cruisers have been trained to estimate timber, and as a scaler is trained to scale logs. Minnesota lumbermen operate in all the different forest conditions enumerated above, and perhaps many more are encountered.

Because of the widely differentiated timber conditions in the state, the Forest Service finds it necessary to have a trained man to look after the slash work in each district. Similarly, any big company will find the slash problem simplified, and the aggregate expense surely cut down, when it has some one competent man to direct slash disposal over its entire field of operations. The forest rangers see a diversity of timber conditions, and can figure out how the slash resulting from them may best be handled. While, on that account, they can frequently assist loggers by suggesting ways and means of disposing of this slash, they cannot, because of their wide range of duties, give to the slash conditions of any one operation the particular attention that is necessary to reduce the cost of this work to the minimum. Neither can logging superintendents nor camp foremen, for the same and other reasons.

To produce efficient results at least expense, brush disposal work should be carefully laid out in detail for each camp before or just as soon as cutting begins, especially in mixed types of forest. This should be done systematically, by a man who understands the business, with a view not only to burn or otherwise dispose of the brush, but to dispose of it cheaply, just as the logging superintendent, with his years of experience, lays out his roads with a view not only to getting logs, but to getting cheap logs. The cases are almost parallel, with a difference. Road building depends upon the lay of the land and relative location of the timber, but does not consider the types. On the other hand, in devising slash disposal methods, one must consider the lay of the land, the quality of the soil, the location of the slash area with respect to surrounding property, the amount of timber to be left uncut on the area, the amount and condition of young growth, the weather, the kind or kinds of timber to be cut, and other factors, in a great many different aspects. To dispose of the brush so as to reduce the fire danger to the necessary degree, and at the lowest possible cost, a man must observe all these things first, then plan his work for each set of conditions encountered. Obviously, a man must be experienced to handle this work to the best advantage of his company. It is a more complicated proposition than the laying out of roads, where experience in one set of conditions will more often apply almost exactly to another, and where so much detail does not enter. Slash disposal is now just as much an item of the logging as is road-making, sawing or skidding, and should be given the proportionate consideration, or the cost will be too high.

CAMP FOREMEN CANNOT BE BLAMED FOR POOR METHODS.

When the disposition of the slash is turned over to camp foremen or other regular employe of a company, the care necessary to evolve the best and cheapest methods of caring for it cannot be given the work. Because of his other duties, a foreman is prevented from devoting more than a small part of his time to planning or supervising the brush work. Usually, he adopts some one scheme which appears good and applies it to the whole operation, even though the timber be of mixed types.

In such case, while any single method might be effective and cheap for one type of the mixed stand, it would probably be needlessly expensive for the others, and very likely ineffective as well. This entails a greater expense on the company than is necessary or justifiable. Were it possible to give each type due consideration, so that the best and cheapest method might be worked out for it, the saving on one operation would be material, and the aggregate saving would increase in proportion with the number of camps.

COST OF SLASH DISPOSAL SLOWLY BEING REDUCED.

Slash disposal has come to stay in Minnesota. It is now and will be a part of every logging job. The big companies will cut down logging costs if they give this work the same careful attention and study that they give the other logging problems. This statement is substantiated by such brush disposal work as has been done in this state. It has been the common experience of most concerns to find the cost of brush burning extremely high the first year. It has been reduced gradually, until in the third or fourth year the cost for the same work is usually found to be in the neighborhood of 75 per cent less than that of the first year. This reduction is brought about because the logging superintendents and foremen learn from experience the best methods of arranging crews and the best time to burn. This, as a general proposition. However, because of their other duties, these men have not the time to further reduce the work to that systematic basis which must consider the points mentioned above. Some of these are: the lay of the land, the soil, the amount of seed on the ground, the quality of young timber, the amount of uncut timber, property adjoining the slash area, location of slash area with respect to railroads and highways, timber to be cut, and the amount of slash it is necessary to actually burn or otherwise remove in order to do away with the fire danger.

All these things must be observed and calculated on in order to do good, cheap work. Even if foremen should attempt to carry out diverse methods of brush disposal, they will not succeed in doing so effectively. Had there been a man with brush burning experience in charge of this work for each company from the outset, the over-large cost of the first three or four years, while the men were learning to burn brush, would have been avoided. In all probability, furthermore, such a man could have produced better results in succeeding years at less cost than has been the case. These statements are reasonable. A man without experience in brush disposal cannot be expected to get that work done so well or so cheaply as a man with experience, any more than could a man without experience build roads to cheapen the cost of logs. The one bears proportionately with the other on the cost of logs, and should be so regarded.

Therefore, any large company which operates in varied conditions of timber will begin to save money just as soon as some good man is assigned the specific duty of supervising the brush disposal work of that company.

ACCOMPLISHMENTS IN 1911 AND SUMMARY OF THE WORK.

When the Minnesota Forest Service was organized, early in May, 1911. It entered upon a very difficult undertaking. The task before it, of securing to the people of the state the most profitable present and future use of their forests and their forest lands, embraced several separate broad components. Each of the latter will be taken up by the Forest Service in the proper sequence of a constructive forest policy. These component parts, produced better results in succeeding years at less cost than has been the which, ends in themselves, together constitute the ultimate purpose of the service, consist in each case of a wide range of details. The latter, by a series of gradations—from quenching a camp-fire, thus preventing the burning, possibly, of a young pine, to the eventual elimination of the fire evil and the marketing of timber from scientifically grown forests—are interdependent, and must be taken up in logical order.

HARDWOOD BOTTOMS ALONG LITTLE FORK RIVER.
Minnesota Forest Service Photo.

ORGANIZATION OF SERVICE WITH SUBSIDIARY AND AUXILIARY FORCES.

This report has shown that the quenching of the camp-fire, leading to the eventual elimination of the fire danger, must be successfully accomplished to save the young pine trees—essentials to practical production of future forests. Wherefore, the service at once entered upon the primary duty of securing fire protection to the forests of Minnesota. In this, the Forester has been vested with authority by the State Forest Law, as the Executive Agent of the Forestry Board. The board was created by that law to administer the state's forests and to supervise the efficient expenditure of funds therein appropriated for forestry purposes. The Forester has been aided by an assistant, and by a field force of rangers and patrolmen, responsible directly to him in the performance of their duties. The concrete field organization of the Forest Service has been aided in considerable degree by a system of auxiliary and subsidiary forces, fluctuating in numbers and capable of much enlargement at need. These have been chiefly the patrolmen of private corporations installed at the instigation of the Forester, other corporation employes, officers of municipalities by provision of the forest law (sections 1 and 24), patrolmen retained in co-operation with the Indian Department of the United States, and the officers of the National Forest Service, deputized as state officers to co-operate with the State Service. All, by systematic arrangements tending to efficiency in fire protection, have been more or less directly under the supervision of the State Forester and the district rangers, and responsible to them.

The steps undertaken by the Forest Service, and carried on by the field organizations and various agents under the instruction or supervision of the officers of the service, have been enlarged upon in detail in the preceding pages of this report. Because the consummation of a constructive forest policy is dependent upon successful fire prevention, the latter has been the principal objective point of the Forest Service in 1911. The measures involved in the operations of 1911 are summarized here in outline form:

SUMMER WORK FROM BEGINNING TO END OF THE FIRE SEASON.

Fire Prevention.

1. Education.
2. Firebreaks.
    - Baudette-Spooner firebreak.
    - Lengby firebreak.
3. Old and summer-cut slash.
    - Logging slash.
    - Right-of-way slash.
4. Permanent improvements.
    - Towers.
    - Cabins.
    - Trails, portages.
    - Telephones.
5. Co-operation other than federal.
    - Railroads, other than patrol work.
    - Settlers.
    - Counties.
    - Towns.
    - Sportsmen.
    - Public.
6. Reconnaissance.
    - Timber and soil typing.
    - Mapping.

Fire Fighting.

1. Usual causes of fires and how to eliminate them.
2. Fire season of 1911.
   Timber fires.
   Prairie and meadow fires.
   Peat fires.
   Beltrami peat fire.

WINTER WORK, FROM END OF THE FIRE SEASON TO JANUARY 1.

Slash disposal.
Co-operation of lumbermen.

CHAPTER XV.

PLANS FOR 1912.

The year 1911 witnessed marked progress in Minnesota forestry affairs, especially along the line of its most immediate need—organization of a force of men to work systematically in the prevention and control of forest, prairie and peat fires. Although it was not a bad year for fires, all the problems pertaining to a bad fire season were encountered in sufficient number to establish precedents in methods of handling them, and to afford valuable experience to the permanent nucleus of the field force—the district rangers. Foundations for work of constructive and cumulative nature were laid; some of the projects were carried along farther than others; a good beginning generally was made.

With experience and a measure of success in 1911, the Minnesota Forest Service should be in a position to make greater progress in 1912. The matter of prime importance, of course, will be the actual prevention and control of fires. This work will be carried on along the lines followed in 1911 and broadened out where necessary; to it all available time and money will be devoted. An important item in fire prevention work is an issue for the remainder of this winter—namely, the enforcement of slash disposal regulations among the lumbermen and other slash-creating operators in the woods.

DEFINITE PROJECTS THAT HAVE BEEN OUTLINED FOR PRESENT YEAR.

Plans for 1912, aside from work in immediate fire prevention, tending toward greater future efficiency of the service, embrace the following definite projects, which will be dealt with in detail:

1. Educational propaganda.
2. Permanent improvements.
   (a) Continuation of tower and cabin building.
   (b) Trail, portage and canoe route improvement.
   (c) Telephone construction.
3. Slash disposal.
4. Land classification.
5. Township patrolmen.
6. Co-operation.

1. Educational Propaganda.

Minnesota has in 1911 made a beginning in conserving her forest resources. Considering the immense area of forest land within her boundaries, the $75,000.00 annual appropriation at the disposal of the State Forestry Board is inadequate. That it is so is due to the past general lack of interest in forest matters. Formerly the demand for fire protection has arisen immediately upon the occurrence of such catastrophes as the Hinckley fire in 1894, the Chisholm fire in 1908, and the Baudette-Spooner fire in 1910; it has then been merely spasmodic. The public at large, where rests the final decision in state affairs, has considered the forests, when considered at all, as a mere side issue—an inexhaustible resource intended only for the enrichment of the lumbermen. The great economic value of the woods has been overlooked. Any attention given to the forest, other than that of a purely selfish nature, has been localized, vague, and lacking in definite purpose. Recent legislation has attracted public interest to the consideration of Minnesota's vital forest problems, and has concentrated and directed that interest into specific channels. The movement began in the early spring with the fight in the legislature for the passage of the forest law now in effect. It has been continued through the year in the face of a widespread disinterest, at first, even disfavor, and has met with remarkable success.

AROUSED INTEREST MUST NOT BE ALLOWED TO WANE

It is very necessary that this movement to attract and hold general favor to the work of the Forest Service should not cease—it is necessary for the good of Minnesota's diminishing mature forests that it should go on and increase in efficiency. Without the aid of strong popular favor and co-operation, the work of forest protection is handicapped. To quote Mr. E. T. Allen, Forester of the Western Forestry and Conservation Association: "* * * the greatest need of the forest situation is honest, vigorous, unceasing spread of knowledge concerning forest economics."

The necessity for a campaign of education is strongly felt by the officers of the Minnesota Forest Service. Much was done in 1911—it is intended to do much more in 1912. The men in the field will continue to do something toward enlightening the people of their districts through personal contact and the local papers. While they will thus do a great deal of good, their opportunities are only chance—the field of endeavor is restricted. It is desired to enlarge the educational field—to make the spread of knowledge a direct as well as an incidental feature of Forest Service work. To this end a good deal of money will be expended. Illustrated lectures will be given during the year; literature describing the work of the service and dealing with the economic value of the forests will be widely distributed. "The North Woods," mentioned previously, will be the official organ of the service, and will reach many readers. Sets of pictures will be loaned by the Federal Forest Service, to which will be added pictures belonging to the State Service. These collections will illustrate the forests, showing their uses and value. It is hoped further to interest the various Boy Scout organizations of the state and elsewhere in the practical side of forestry. That feature of the educational campaign will deal for the present more particularly with fire protection.

There is no question but that any money spent in educational work will do a great deal to increase the change for the better in the popular conception of forestry, its principles and aims.

2. Permanent Improvements.

It has been shown that the efficiency of the field force of the service can be heightened by certain so-called "permanent improvements." What these are, their value, and what was done toward installing them has been previously detailed. It is intended to continue this feature of the service work in 1912, along lines as follows:

CONTINUATION OF TOWER AND CABIN BUILDING IS PLANNED.

Lack of time prevented the completion of some of the lookout tower projects undertaken in 1911. These will be completed in the spring of 1912 and put in shape for use. Other sites have been selected this winter

WHERE ROADS AND TRAILS PERMIT, RANGERS USE HORSES TO PATROL THEIR DISTRICTS.

Minnesota Forest Service Photo.

upon which towers will be erected in 1912. It is planned to erect all necessary towers as soon as possible, so that the service may not be hampered for lack of them should a dry, dangerous period occur in 1912. As in 1911, patrolmen will be placed on such work when not otherwise employed.

The lookout towers are invaluable in locating fires. To utilize effectively the knowledge of a fire is the immediate duty of patrolman or ranger. The axiom of the fire fighter is: "Stamp out the little fires, and you won't have to fight the big ones." The truth is self-evident. A fire, which, if taken an hour after its discovery, might be put out quickly by a patrolman working alone, with a start of ten hours in a dry season, would require a small army of men with tools and provisions to control it. That sort of work costs money, to say nothing of the timber and other property destroyed. Therefore, it is necessary that patrolmen be supplied with the most rapid means of travel possible to use in a given locality. Where roads are good, horses and even motorcycles may be used very effectively, and launches can be used on a few of the larger lakes and rivers.

FIRE LINE IN COURSE OF CONSTRUCTION.

Minnesota Forest Service Photo.

However, much of the forest area of Minnesota is yet a wilderness; the localities where horses, motorcycles, or launches can be used are few. In most localities the patrolmen must travel on foot or with canoe. It is here that fires most often are disastrous. Because existing modes of travel have been so limited, it is difficult for a forest officer to get to a fire while it is small, or to take in a crew of men. There, too, it is ordinarily difficult to collect a crew of men, because the country is so sparsely settled. Hence, under former conditions, a fire, small when discovered, might be too large for one man to extinguish ere it could be reached by a patrolman. Then, before he could get out, collect a crew of men, and bring them in, it might be almost beyond human control. To facilitate travel, therefore, thus increasing the likelihood of fires being put out while small, occupied not a little of the time and attention of the service field force in 1911. Improvement of portages along canoe routes accompanied the trail work to the same end. All but a little of the work was done by the regular officers of the service, as their time and duties permitted.

With the coming of winter, shortage of funds enforced the curtailment of expenditures; hence most of the field men were laid off. This, of course, put a stop to the trail and portage work for the time being. Because of its importance, the work will be carried out as completely as possible in 1912. As in 1911, most of the labor will be performed by the field force. It is planned to increase the usefulness of the trails and portages by putting up sign-boards along them. These will be of good quality and will furnish information along canoe routes and trails as to the compass bearing, length and distance from and to certain points. They will be colored to attract the eye; thus the beginnings of trails and portages will be easily known. Lack of them in this connection has formerly been a great hindrance to woods travel. Furthermore, good camping sites will be selected and plainly marked. An endeavor will be made to secure general use of these, which will lessen the danger of forest fires originating from camp-fires, because campers can be more easily watched. All this which it is possible to accomplish will tend to more effectual fire protection.

TELEPHONE CONSTRUCTION NECESSARY FOR PROPER PATROL OF THE FORESTS.

This report (page 40) has shown that telephone lines in connection with lookout towers and rapid means of travel, constitute the third of a trio of agencies indispensable to a patrol force in the protection of our forests from fire. The question of legality, which practically precluded the use of service funds in the co-operative construction of telephone lines, proved a great hindrance to the service. Had it not been for that question in the law, the service could have gained the use of many lines, at an expenditure within the scope of its funds, on a co-operative basis. Since they were too costly for the service to purchase outright, they are not now available for use in places where they are highly desirable, save by the payment of regular toll charges. There are many localities, at present without, where phone lines would be of great assistance in fire protection, even though tolls were exacted from the service. The fact that settler lines in these localities would connect with toll lines is prohibitive of the Forest Service co-operating in their construction. Since neither the service nor the settlers were in shape financially to put through any of the desired lines alone, they have not been built.

"Efficiency" is the aim of every public or industrial organization; efficiency in fire protection is the immediate aim of the Minnesota Forest Service. The trio—lookout towers, good means of rapid travel and telephones—in a systematic arrangement of continuity between all portions of the state where bad fires occur, with a force of picked men to use them, together with popular support, means efficiency. So, every effort will be made in 1912 to hasten the perfection of the availability of these means in protecting the forest.

3. Slash Disposal.

It is absolutely essential to the future effectiveness of Forest Service work in Minnesota that **it shall be successful in securing slash disposal this year.** Therefore, it is necessary that a force of men adequate to handle the situation shall be on duty in the spring when much of the slash resulting from the 1,500 separate camps is to be disposed of. The fourteen rangers and those assistants on duty at present will remain. The number of men will be more than doubled to effectually cover the ground. In addition to these men, it is possible that, in accordance with the forest law (section 15), crews may have to be hired by the service to take care of such slash as may not be disposed of by those responsible for it.

In order that a minimum of slash disposal, with its consequent entanglements, may have to be done by the service, plans have been made to hold meetings of lumbermen. There the subject of slash disposal will be thoroughly discussed, in order that those methods which are cheapest, yet effective, may be brought out. An endeaver will be made to show those timber operators, who may still believe that slash disposal costs more than it is worth to them, that such is not the case. It is hoped thus to procure real co-operation from all of the operators. If this can be done, the work of slash disposal will, as a consequence, be completed in a more satisfactory manner to the service than were it to be done only under protest.

4. Land Classification.

While fire protection is a necessary feature, it is but the initial proposition of a constructive forest policy. To ascertain the location and extent of those lands which may be more profitably devoted to timber than field crops is a second, and accompanying, measure. Contrary to the general notion, there are extensive areas of such lands in the forest regions of Minnesota. The field force of 1911 took comparative note of such lands as they observed in the course of their travels, and reported to the Forester the location of those which they considered strictly forest land. While not nearly all such land was examined, a total of approximately 2,000,000 acres was thus denoted, exclusive of the Superior and Minnesota National Forests. They are widely scattered, and the total acreage reported will undoubtedly be increased by further reports from rangers in 1912. The value of these areas as forest soil will either be refuted or corroborated by investigating, or "reconnaissance," parties to be placed in the field the coming summer, in addition to the party north of Red Lake this winter. The results of their investigations will be made public, and should prove valuable information for investors or settlers. The latter will know then, better than formerly, where they may locate with reasonable hopes of making a living from the soil. Minnesota is fortunate in having a great variety of soils. Most of these are wonderfully rich, and some of the very richest districts are still undeveloped. There is an enormous region of fertile land as rich as any in the state, and capable of producing most anything in the way of crops. Practically all of this district, comprising millions of acres, is awaiting energetic settlers and the plow. Other millions of acres are of such a character that the land should be kept permanently growing timber. Those mighty hills of massive rock and gravel, covered with pine and spruce and birch—those rock-bound, island-studded lakes—those rushing streams winding to the Mississippi, tumbling to the St. Lawrence, or wandering off northward to Rainy river and Hudson bay—constitute the finest and wildest playground and hunting-ground of the Northwest. Much of this region is unsuited for farming. It would be unfair to expect a settler to make a living on the rocks. The best interest of the state, as well as the settler, requires that this rocky land be used as our woodlot, to produce timber for ourselves and for the future. It is to determine the location and extent, and possibilities of timber growth on these lands, that land examinations will be carried on.

CORNER OF RAINY LAKE, ROCK-BOUND AND ISLAND-STUDDED, ONE OF THE WILDEST PLAYGROUNDS IN THE NORTHWEST.

Minnesota Forest Service Photo.

5. Township Patrolmen.

Section 24 of the new forest law includes a clause to the effect that any organized township in the state is authorized to levy a tax therein, not to exceed five mills, to be known when collected as the "Fire Fund." It is to be expended in meeting the costs of preventing and fighting fires in that township.

In accordance with this clause, the service is now taking up the matter with the officers and voters of all organized townships in the ranger districts. It is advocating the authorization of such a levy at the township spring elections. Townships are being advised to levy this tax, and to spend it in such a manner as to protect life and property in the townships from fire. For the latter, the service advises that the money so raised in any township, or such part as may be necessary, be devoted to paying the salary of a township patrolman for that town. It is felt that such a step will be the most effective in preventing fires.

The present attitude of many town officers and voters indicates that in a large number of townships this levy will be made, and township patrolmen appointed, in accordance with the advice of the service.

When appointed, a township patrolman will be given a commission and badge by the State Service, which will give him authority to act in the performance of his duties. His salary will be met from the "fire fund" of the township in which he is appointed. He will be given instructions somewhat as follows:

1. Patrol the town thoroughly during dry, dangerous times.
2. Guard carefully against any fire getting started.
3. Put out any fire that may be started, no matter how small it is nor on what kind of land.
4. Study the forest law carefully, and see to it that no violations of the law occur in your town.
5. See that all road slash, clearing slash, and other fire dangers are disposed of according to the law.
6. When the situation demands it, make arrests for violation of the forest law in the town. Summon help when necessary to fight fire in or threatening this town. Temporary labor will be paid for from the "Fire Fund" of this town. You may not incur expense chargeable to the state, unless authorized by the District Ranger to do so.
7. You will work in co-operation with the forest officers of the state, and consider carefully any advice the District Ranger, Mr. ...., gives you.
8. You are authorized to perform your duties by the enclosed commission from the State Forester. You will wear the badge at all times as the sign of your authority.
9. You will devote your entire time to the work, from the date of your appointment until laid off duty.
10. You will keep a diary, making daily notes of your travels and transactions, instructions given, etc. In any special emergency, you should call upon the District Ranger for advice.
11. You will receive $.......... a month and pay your own expenses.

SPECIAL PATROLMEN TO WORK WITH STATE FOREST OFFICERS.

The benefit such men will be to the townships in securing fire prevention is evident. Working, as they will, in close co-operation with the regular State Forest officers, the service will be strengthened. It is hoped that a great many towns will take advantage of the opportunity.

Township patrolmen, the patrolmen to be installed by lumbermen to protect their timber holdings, and railroad patrolmen, all working in systematic co-laboration with the service, will materially increase the strength and efficiency of the latter.

Thus, there will be five kinds of patrolmen in the state this summer, namely, state, federal, township, lumber company and railroad, all working together under the supervision and advice of the district rangers and State Forester to protect our forests from fire.

6. Co-operation.

The object of educational work in forestry is to awaken popular interest in its principles and aims. An awakened interest in forests and forestry means better understanding of them. It means knowledge of the fact that the systematic application of scientific forestry on a practical basis will tend to make them of the greatest benefit to everyone. Such knowledge will bring about a clearer idea of the value of the forests to all the people; hence, should make the people as a whole more eager to see their forest resources recalled from too rapid diminution, then rightly developed and utilized. That attitude will naturally make the people anxious to assist in the work to the degree, at least, in which their selfish ends are involved. Therefore, the ultimate end to which popular education in forestry should lead is popular co-operation.

The desired result is being achieved in Minnesota by the educational work of the service. This is conclusively shown by the accounts, in this report, of the direct co-operation accorded the service in its work of fire protection, especially fire prevention, by many interests which have formerly been important factors in the origin or spread of fires. Conspicuous among these are settlers, villages, townships and counties of the forest region; lumbermen and others who cut timber; railroad companies whose lines traverse the forests; and campers. True, every one of the factors just named, in fire origin or spread, or fire prevention and control, as the choice may be, is financially or otherwise directly interested in the forests. It may therefore be considered by many people that, being so obviously concerned in forest affairs, upon them should rest the entire responsibility for that co-operation with the Forest Service, in fire protection and beyond, which is so vitally necessary to the welfare of the forests. Not so. The settlers in the forest; the villages, cities, townships and counties which are liable to be wasted by forest fires; the lumbermen who hope to profit by the continuance of their operations; the railroads who depend for a large part of their freight tariffs upon the products of the forest; and the people who look to the woods and lakes for their recreation—are every one but the concrete evidences of great systems of ramifying interests, all proportionately dependent upon the forests, and responsible for forest preservation.

ASSISTANCE OF LUMBER COMPANIES NEEDED IN PROTECTING THE FORESTS.

For instance, consider the big lumber companies, interested in forests to the greatest obvious extent of any of the above. (By the "companies," specifically in this connection, is meant those stockholders and other investors who have their money tied up in the companies.) The lumber companies, therefore, have spent large sums of money, in the purchase of timber lands, in building logging roads and railroads, in building mills, in putting rivers in shape for driving by building dams, etc., and in the purchase of expensive equipment for the logging and other departments of the industry. Such huge investments have been justified only by hope of profit from the development of those forests which incited them. The investors depend for returns upon the profitable outcome of their investments. Radiating gradually backward from the investors are long lines of industries which rely to a certain extent upon the purchases of lumber companies (including all concerns which cut timber) for their existence. That extent may be great or small, as the case may be, but it is nevertheless sure.

The diversity of interests that profit by the forests before the trees are cut is endless.

Manufacturers and jobbers of machinery, to the infinite variety needed to equip a big sawmill; manufacturers and jobbers of all manner of tools and implements, chains, ropes—vast amounts of which are used by lumber companies; manufacturers of glass for the big windows in sawmills; the steel mills which produce railroad rails; locomotive and car manufacturers; and, back of them and the implement factories, the smelters and the miners—all these industries rely in great measure, some almost entirely, upon the trade derived from lumber companies, thence directly upon the forests. Consider the vast number of men, employes of these industries, who depend for their means of existence upon that employment, thence directly, in equal ratio with the industries they work for, upon the forests. Therefore, in equal ratio with his dependence upon the forests, every man, from the miner with his pick, through the shops, operating and sales departments, to the man with money invested, should desire to, and should, cooperate in the work of fire protection. To that degree, then, he will be petuating the forests as a prominent feature of our state and national industrial prosperity. Every employe should co-operate, not only because of that abstract value of the forests, but more especially because he will thereby aid in assuring to himself their continuance as an important factor in the business to which he looks for a livelihood.

DANGER OF FEDERAL FIRE PROTECTION FUND BEING CUT TOO LOW.

It may appear a difficult matter for a worker in a Pittsburgh blast furnace, for instance, apparently so far removed from any direct contact with the forests of Minnesota, to aid in their protection from fire. It is not difficult, nor is the idea far-fetched. For example, the abstract idea of fire protection is good. In order that the idea may become a concrete actuality, it has been found necessary to enforce fire protection in the first instance by state and national legislation, whereby public funds are appropriated so that the great work may be initiated and carried on. Such fire protection legislation as has been enacted and enforced has proven good The sum of $1,000,000.00 was available in 1910 to pay the costs of fighting fire on the national forests of the United States, two of which are in Minnesota. What part of it was expended in that terribly dangerous fire season of 1910 effected the saving of vast amounts of timber. That timber is to be used for the benefit of the whole people. There is now, in the present congress, a movement on foot to cut this appropriation from $1,000,000.00 to the comparatively small sum of $200,000.00. Should this movement be successful, it means disaster. If the coming season of 1912 is as dangerous for fires as was 1910, the National Forest Service will be seriously handicapped in its work of conserving the timber on the national forests. Success in this movement means, in that event, that probably millions of dollars' worth of the people's property will be destroyed by fire, for lack of that portion of $1,000,000.00 which would have saved it. This would indeed be a national calamity, the outcome of poor business. Now, then, any laborer in the Pittsburgh blast furnaces, his co-workers and their friends, could, if they realized the influence which the forests exert upon their lives, assist in bringing such pressure to bear upon congress that the unbusinesslike, unprogressive movement which tends to forest destruction and national loss would be killed. That would be real and effective co-operation in fire protection. Moreover, with an understanding of these things, our laborer could refuse to cast his ballot at the next election for any man who had stood for that unprogressive movement, and vote for a man who opposed it. This one example serves to show that there is no laborer in a blast furnace, or any other man, however far he may be removed apparently from actual contact with the forests, who cannot, if he desires, co-operate with the Forest Service in the protection of our forests from fire.

THOUSANDS OF MEN RELYING ON TIMBER CUTTING FOR DAILY BREAD.

The foregoing conclusions have demonstrated the extent to which the standing forests, through the medium of the lumber companies, exert an influence upon the daily work of multitudes of people. The forests, through the medium of the lumber companies as moving factors, are of more peculiar, but not more real, influence upon the lives of other multitudes when once cutting has commenced. In this connection it is perhaps more obvious than in the other. There are thousands of men in Minnesota today who rely for employment solely upon the operations of the lumber companies in the state's remaining timber. There are probably forty thousand men working in the woods alone this winter, not to mention the mills and factories nor the people dependent upon them. These range from the chopper in the woods to the general manager; from the camp clerk to the head of the company warehouse—all looking to the forests to furnish them a living. Furthermore, there are whole towns in Minnesota built up around the manufacturing end of the woods industries, or more or less dependent upon them. The stores and other interests there, dependent for their support upon the employes of the companies, should further by every means the perpetuation of the industrial features of the forest. These busy, progressive lumbering cities of Minnesota should be the more ready to assist in the work because of the examples they have before them of other cities in Minnesota, Wisconsin and Michigan, which have passed out with the passing of the lumber industry in their localities. Those towns which have not been killed have experienced a severe check, even though some of them have had farming and its kindred occupations to fall back upon. Their fate will be the fate of other towns—Minnesota towns—at present active, should the lumber business cease.

FORMING AN ENDLESS CHAIN IN WORK OF CO-OPERATION.

The radiating influence of the standing forests is repeated when they are cut and utilized. The **producers** of the raw materials which supply the **factories**, which sell to the **wholesalers**, distributing to the **retailers**, who sell their wares to the **wage-earners** in forest and mill—are, with their employes, and the lumber companies and their employes, all more or less dependent upon the forests. Therefore, the stockholder should advise with the president of the company on the work of disposing of slash; the president should require of the manager, and so on down through logging superintendent, walking boss, and camp foreman, to the man who piles and burns the brush, that the logging slash should be disposed of. (This may sound like "The House That Jack Built," but it is logical.) The man who burns the brush can co-operate with the Forest Service to better purpose, by doing effective work, than can the worker in the Pittsburgh blast furnace, who can aid only with his vote. He can also be careful with his matches when he lights his pipe. The cruiser should be careful to extinguish his camp-fire before leaving it; most cruisers are. But the brush-burner and the cruiser, too, with the storekeepers and their clerks, and all the vast number of other men whose incomes depend completely or in part upon the future cutting of timber, can and should, by the ballot and other means, exert upon legislation an influence beneficial to the forests, the state and the nation. Thus they can, and, because they will thereby serve their own interests, should, co-operate with the Forest Service in preserving the forest from destruction.

RAILROAD COMPANIES GET INCREASED REVENUES IN HAULING FOREST PRODUCTS.

As it is with the lumber companies and their employes, and with the industries interlocking with the lumber industry, so it is with the railroads. They increase their revenue by carrying the products of the forest. Not only that; they carry from outside manufacturing points to the forests the machinery and supplies which are required there. In proportion to the business a railroad does, just so many men can it retain in its employ, and vice versa. With an increase in business it requires new equipment, bringing us back through the intervening steps to the man in the blast furnace, and back of him to the miners of iron ore in Minnesota. Just so far as the business of the railroads is aided by the forests, just that far are vari- the other hand, just so far as the business of the railroads is hurt by the ous related industries aided, with their stockholders and employes. On diminishing of the forests, that far are the other interests harmfully affected. Consequently, we have an intricate system of radiating interests which are depending upon the forests to some extent through the medium of the railroads. All should therefore aid forest protection, by urging upon and assisting the railroads in their co-operation with the service in that work. Here, too, the means are at hand. The section men who clean the right-of-way can do good work; the master mechanic can see that the spark arrester screens on the locomotives are in good condition. The latter can also see to it that forest fires do not originate from the ash-pan of the engine. The laborer in the Pittsburgh blast furnace can cast his intelligent ballot.

SPORTSMEN AND THE INTEREST THEY SHOULD TAKE IN THE BIG NORTH WOODS.

The sportsman, too, is a medium, together with the lumber companies and the railroads, through which the forests exert an economic influence upon the country. They furnish cover for the game which calls him out. In pursuit of that game he expends quantities of ammunition. He buys guns, tents, canoes and endless other paraphernalia, in the production of which countless citizens gain their living. The ammunition bought from the retailer means renewed activities all along the line back to the charcoal burner. The guns involve once more the toiler in the Pittsburgh blast furnace. And so it goes on—the diminution of the forests, with the consequent proportionate decrease in the sale of ammunition, tents, guns. compasses, etc., etc., hurts more or less every employe of every industry which caters to the sportsman or the camper. So, not only is the forest of prime importance to those who seek those most healthful forms of recreation which the woods afford; it is of economic value to all those thousands of others "behind the scenes." They, too, with the sportsmen and campers, should aid as they can in preserving the forests from destruction.

MOOSE EATING LILY ROOTS FROM BED OF LAKE NEAR ELY, IN NORTHEASTERN MINNESOTA.

Minnesota Forest Service Photo.

TAXABLE VALUE OF TIMBER WILL DECREASE WITHOUT PROTECTION FROM FIRE.

The forests, as a supply of raw material wielding a great economic influence upon the lumber manufacturers, railroads and upon the industries which are kindred to or connected with them, extend even farther in that influence. The forests pay large taxes—the income from which is diminishing. Aside from those other lands which could be used for other purpose, but are most profitable when devoted to timber production, there are great areas of land in Minnesota which, denuded of forests and not reforested, will cease to pay taxes, and will cease to be of value to the state, because they will raise no other crop than timber. Many of these are at present timbered, paying taxes. Every thousand feet of timber on them, or any lands, which is destroyed by fire, means a decrease in tax receipts for the ensuing year and after, until a new crop of timber is grown thereon.

PINE LOGS READY FOR SHIPMENT BY RAIL.
Minnesota Forest Service Photo.

Hence, every taxpayer in the state—if for no other reason than that he is a taxpayer—should lend his influence by ballot, and active aid where possible, toward protecting the forests from wasteful diminution by fire or otherwise, and to promote their continued existence.

FOREST INFLUENCE ON FARMERS IS NOT CONFINED TO AGRICULTURE

Aside from taxes, the economic importance of this "raw-material," or industrial, side of the forests is more far-reaching in Minnesota than is ordinarily understood. They are not of value only to the parts of the state where merchantable timber is found. They are of great importance to the farming regions; thus: The great timber industries in woods and town and city require large numbers of draft horses; in fact, are principal buyers in the horse markets. Horses are becoming one of the great sources of profit to Minnesota farmers, more and more attention being devoted to that branch every year. As the forest industries decrease in extent every year, the market for horses decreases and new markets have to be sought out. With the rapid increase in the cities and elsewhere of the use of automobiles where formerly horses were used, the markets for horses are becoming restricted. The farmer, therefore, should do all in his power to perpetuate that lumbering industry, in the logging end of which, at least, horses cannot be displaced by autos. Horses require feed —oats, corn, bran, hay. Immense quantities of these farm products are purchased every year to feed the logging teams of Minnesota. Furthermore, the camps in the woods, of which there are 1,500 in Minnesota this year, require immense quantities of beans, beef, pork, potatoes, cabbage, onions, and almost every variety of farm products, to feed the great army of woods-workmen. Therefore, a decrease in the logging industry directly affects the farmers of Minnesota to a really large extent. The latter, therefore, should wish to see this industry prolonged, and perpetuated, wherever forests can grow most profitably, and they should co-operate in this work of fire prevention.

WHY THE AVERAGE CONSUMER MUST LOOK TO FORESTS FOR SUPPLIES.

Everyone realizes the importance of the finished products of the forest to the consumer. What would we do without turpentine, that by-product of the coniferous woods; without wood for our furniture, without wood for our finish, without wood for the various thousands of uses to which it is an absolute necessity? True, cement is displacing wood in various places, but to a much less extent than most people believe. But turpentine cannot be made from cement. Neither can a great many other of the products of wood, important articles of commerce and necessities of life, be made from cement. What man or woman, whose house is finished in maple, or pine, or oak, or birch, or walnut, would wish to have those beautiful, warm woods, which so increase the comfort of a dwelling, replaced with cold cement? How many women would desire a dressing table of cement?

These are but a few of the ordinary indispensable uses of wood. The aggregate consumption of all sorts of forest products is increasing. The latter has been accompanied by a gradual decrease in the supply of raw material. Where the demand for any article of commerce is expanding, and the supply contracting, the result is an increased cost of that article. Hence, the people of Minnesota and the United States as a whole have in the past few years seen the price of timber products double. The rapid decrease in supply has been brought about not only by increased consumption and by wasteful methods of manufacture, which factor is becoming less important as new ways of utilizing the waste are discovered, but through forest fires. Forest fires are preventable. When fire prevention is secured in Minnesota, thus permitting the sure growth of new forests, the price of wood manufactures will become fixed at a point which allows of a fair profit to the manufacturer over cost of production. In addition to fire prevention, however, before the people can be assured of a permanent supply of forest products at a fair price, the annual increase in timber growth must approximate annual consumption. It is in fire prevention, to make possible renewed tree growth and the balance of supply and demand, that the Forest Service seeks the active co-operation of every consumer of forest products.

MINNESOTA IS THE LAST STRONGHOLD OF SPRUCE FOR MAKING PAPER.

One important article of daily life, a product of the forest, is wood-pulp for paper. It first came into prominence for general use in the middle seventies. Soon it was found that wood-pulp, especially that from spruce and other softwoods, was the cheapest satisfactory material from which newspaper could be made. With the use of wood-pulp in this connection, the cost to the reader of his newspaper became less, and he received more reading matter. Where formerly newspapers were only afforded to any extent by the more well-to-do, they became a daily necessity of the poorest. This cheapness, and the common desire of rich and poor to be acquainted with the events of the day, increased the demand for newspapers. This resulted in a terrific invasion of the spruce forests for pulp. They rapidly diminished. This invasion sweeping westward with the decrease in available spruce has entered Minnesota in late years. With the decrease in cheaply available spruce as raw news material has come a search for new woods for the purpose. None has been found so satisfactory and cheap. Consequently, the price of the newspaper to the reader has been going up. Minnesota is one of the last strongholds of the best spruce for pulp in the United States. It is going, even here. Already much Minnesota capital is being invested in Canadian spruce lands, which, in itself, hurts Minnesota. When the time comes that our spruce forests are exhausted—and it will come if they are not protected from fire—every newspaper reader will have to pay more for his daily or weekly sheet. Possibly not especially noticeable to the individual, this will amount to an immense loss in the aggregate to Minnesota. Therefore, every reader of a newspaper—if for no other reason—should assist in that work which is being carried on to preclude the possibility of the further destruction by fire of the state's timber resources, with their forests of spruce.

FOREST INFLUENCE ON STREAM-FLOW AND UNDEVELOPED WATER-POWER.

Entirely aside from the economic value of the forests as a supply of raw material upon the production and manufacture of which so many industries are dependent, the former, in themselves as standing timber, are extremely valuable. Thus, one of the greatest natural resources of Minnesota lies in her lakes and streams. This, by reason of the food and game fishes in them, their navigability, and more especially because of the great quantity of waterpower they have been, or may be, harnessed to develop. In this connection, the "Report of Water Resources Investigation of Minnesota, 1909-10," states:

"The average developed water power being	113,100 H. P.
The total installation of water power	185,115 H. P.
The total estimated available water power (without storage)	553,700 H. P.
The total estimated available water power (with storage)	750,000 H. P.

These far too conservative figures indicate to a very small extent the value to the state of Minnesota's water power. New development projects are being undertaken every year, each of which, in the installation alone, brings an immense amount of money into the state. Wherever in the vicinity of a town a new project is undertaken, the business of that town,

HOW RECEDING FORESTS HAVE AFFECTED MOISTURE IN THE GROUND.

Formerly timber on the hillsides and bottom lands protected the heavy snow from too rapid melting, permitting the water therefrom to soak into the soil, and so gradually to reach the river. Raging spring floods were then not so common; power projects could depend upon an equable amount of water all summer, until the fall rains renewed the ground supply, and reservoirs were not filled up with mud. Now, however, the snow in the spring, unprotected by forests on these particular watersheds, goes so rapidly that only a very small part of it, with the rains, has time to soak into the ground. Most of the melting snow and the rain water therefore runs off swiftly over the surface, all of it being poured into a stream practically at once. This causes a torrent. Immediately when the snow is gone, the flood subsides through lack of supply and the stream shrinks to normal stage. The latter is maintained for a time by seepage from what little moisture the ground has retained. This exhausted, the stream becomes a creek, and log drives are "hung up," causing the shutting down of sawmills and lack of employment for many men. Flour mills, run by water power, must keep their head-gates closed days at a time, in order that they may get "head" enough to run for one day. Normal rainfall does not reach the streams, being absorbed and retained by the dry earth. With heavy rains or cloudbursts, the surface run-off not being retarded by forest cover, great floods again occur, with like ensuing conditions, often leaving a trail of death and devastation behind them. The flood of Johnstown, Pa., and more recently that of Austin, Pa., and Black River Falls, Wis., are cases in point. These and similar calamties have repeatedly occurred in the United States and in this state, where no active consideration has been given to retaining forests to regulate water run-off.

CUTTING AWAY THE TREES BRINGS FLOODS TO THE RIVER VALLEYS.

Everyone knows of the annual floods in the upper Mississippi. These always occur in the spring when the snow goes off, and often during the summer when heavy rains occur. The timber on many of the tributaries, as well as the main stream, has been largely removed. Consequently, as the snow melts very rapidly, and the surface run-off is unretarded, the floods arise and subside quickly. Since there is very little surplus moisture remaining in the ground, the change from flood to normal and sub-normal stages is so rapid that in recent years the log drives on the Mississippi and its tributaries have been uniformly hung up; mills have been compelled to shut down; and navigation is impeded. Relief comes only with another flood, after heavy rainstorms, when operations may be resumed temporarily. Occasionally, these floods are of such violence as to endanger life and property in Minnesota. When the floods of the upper Mississippi basin are given added impetus by the Ohio and other tributaries farther south, the lower river has been known to do millions of dollars worth of damage. Were the banks of the upper Mississippi and tributaries wooded, the probability of such floods, with their detriment to commerce and manufacturing, and their frequent destruction of life and property would be materially reduced.